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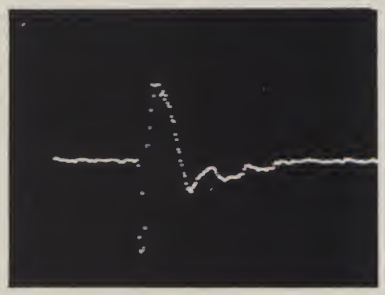
The sky's the limit for this meteor camera. See page 50.



The sound of breaking glass captured on your microcomputer. See page 56.

A micro you can grow with. See Page 76.

Cover photo of the computer by Jonathan Nash.

Cover photo of the comet by Dennis diCicco/Sky and Telescope Magazine.

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PUBLISHER'S REMARKS

By Wayne Green

Micro Bonanza

Cash In On the Growth

Anything negative you've heard about being rich is pure sour grapes. It is one hell of a lot more fun than being poor.

One of the reasons I keep dwelling on making money is because the microcomputer field offers such a wide range of superb opportunities to cash in on the coming growth. In most fields, if you know the secrets of success, you can do well. In the microcomputing industry, you can become a phenomenon. It's a lot easier to be a success in a field which is growing and which is going to continue to grow for an indefinite time.

Opportunity for Success

Computer hobbyists, by the hundreds, are taking advantage of this potential by opening stores to sell and service computers. Hundreds more have gone into business making add-on products or producing software, with several dozen making it into the millions column. . . and a few hundred losing their shirts.

If you look at the microcomputer industry today, you'll see its awesome growth over the last seven years. Yet, if you put it into perspective you can see that microcomputing is still in its early stages of growth, with no real end in sight. That means that the opportunity to get started in a small business and ride its growth to success is better than ever.

In my editorials, I've been citing the many areas of growth I see open to the beginning entrepreneur.

By investing money in a new business, an entrepreneur has a chance to make that business grow and create more jobs. Without investment money, a business's growth rate is much slower. Remember that our population is growing, and thus there is a constant need for more jobs.

Bureaucrats and Taxes

Of course, when a business grows, so do taxes. Money taken away from individuals and businesses in taxes provides jobs for bureaucrats, not for products we can buy. This causes a slowing down of the cash movement.

I suppose that if government services were bid to competing firms, we might get a better run for our money. It's kind of like having a firm with 90 percent of the employees in management and 10 percent producing goods. The end result: more money is taken in taxes and fewer jobs are possible.

But what about the millionaire who buys a yacht? That's wasted money, isn't it? Parts made by a hundred firms go into the yacht, along with an enormous amount of labor, which results in workers taking home paychecks which are spent not only on cars, food and expenses, but on taxes. The money keeps right on moving around in circles, except for the percentage taken out in taxes.

Now you may argue that I'm being unfair in categorizing tax money as wasted. Obviously it all isn't wasted. We *do* need services such as the police and the military. But these worthwhile functions of the government seem to get lost in a blizzard of waste.

Having worked at one time for a research and development firm, I can tell you first-hand that the waste of money in just that aspect of supplying the military is awesome. Also, I was in the Navy during the war and I saw incredible amounts of electronic equipment being trashed when the war ended, rather than being made available to industry.

There is much to be said for the Proposition 13 and Proposition 2½ approaches to weaning the government of waste and corruption. The politicians try at first to cut services; but eventually, pressure from the people forces efficiency from the government.

The governor of New Hampshire appointed a task force of businessmen to assess the state government, looking for areas where services could be cut, consolidated or made more efficient. The result was a practical report, at little cost to the state, showing how millions of dollars could be saved, both in state and federal programs. At a recent Chamber of Commerce meeting, the local businessmen made it clear to all of the people seeking election to the state legislature that they

want to see these recommendations implemented.

President Hoover set up a similar commission about 50 years ago. His group came up with a large number of practical ways to cut government and save money. Few of the recommendations were implemented.

Perhaps it is time for a new task force from the private sector to study the federal government and come up with some recommendations for both improving services and cutting costs. Businessmen *have* to think in these terms because they are in competition with other businesses. If the difference in quality or price varies more than clever marketing can cover up, a business is in trouble.

Waste Not . . .

My own approach to keeping taxes low and thus sending little money down the garbage chute in Washington is simple. If you think of the cash flow for a business as a continuous process, where a little slowing of the income results in the accounts payable building up and a speeding up of income lowers the accounts payable, you have the idea.

If the income gets two months ahead of being even, you basically have to send one month of that income to the government to help them pay for old army bases and antique battleships. If you get two months *behind* with income, your suppliers are letting you use their money for your growth and there are no taxes on profits. Obviously, the more you can run a business on credit, the more money you'll have to invest in more jobs . . . which is growth.

The tricky part is to avoid getting so far behind that your creditors start to get disturbed. There are perils with this type of growth financing too; any unforeseen drops in sales can quickly get your suppliers upset. You have a much narrower margin for error when you are skating on the brink of overused credit, and you'd better be sensitive to any slowing down of income.

The Opportunities

With the microcomputer industry growing at such a rapid rate, it's obvious that the income won't be slowing down. We do see some slack as a result of the current economic chaos in the world, but nowhere near the problems besetting more stabilized industries. We know that in the long run we are looking at many years of increasing demand for small computers and communications, so we couldn't find a better industry in which to work.

There are only about 5000 stores selling computers today. That's nothing compared to what I expect to see within three or four years; I think we'll have ten times that many. If we're going to support the need for computers in business, in schools and in the home, we are going to have to build up an industry perhaps a hundred times the size of what we have today.

The opportunities are there, if you've built up your own skills. This market is going to require computer stores to sell the systems. It is going to take a service network vastly beyond anything we have today. We'll need software stores and we'll need software specialists to custom-

> We have to build up an industry perhaps a hundred times the size of what we have today.

fit software for businesses and homes. We'll need an unending supply of innovative accessories for our systems.

The retail businesses will have to be supported by distribution, which will include local salespersons for many of the larger firms, manufacturer's representative organizations, distributors and factories. The promotion of the products will bring about the development of specialty advertising agencies.

The rash of small electronic gadgets we've seen in the last two or three years is nothing compared to what we will have in a few more years, when we'll be able to marry microcomputers, communications systems, new types of chips and business needs into specialized equipment.

More Interest

We're seeing a growth in interest in portable computers, sparked by the extraordinary success of the Osborne. We're starting to see some serious handheld computers; how long will it be before we have a handheld computer the size of a small hardcover book? The lid may be an LCD readout and the computer will be able to communicate via microwave with any nearby computer system acting as a terminal or as a self-contained computer. I'll give it two or three years.

With microelectronics, the keyboard won't even need wires to connect to the computer. We already have small signaling devices which plug into the power lines and which can control lamps and other gadgets anywhere in the house by remote control. These are sold in Sears.

All of this is going to require technical and sales skills to make, distribute and service. The people who take the time to develop these skills are going to have the advantage.

Like Apple, most of the large businesses today got started in a garage or a cellar somewhere. Sure, for every big success there are a thousand busts, but if you do your homework and pay your dues, you'll have a good chance of being one of the winners.□

By Frank J. Derfler, Jr.

Softerm Earns Honors Status

Bank Box, Infone, RCA VP-3501 Lead New Terminals

Welcome to the 36th edition of Dial-up Directory.

Before we move into the fourth year of our examination of data communications systems, I would like to introduce you to three unique kinds of communications terminals: one for home banking, one for use with information utilities and one for portable operations. But first, let's look at a handy switching device and a new entry onto the software honor roll.

A-B Boxes

Back in the early history of communications, a smart technician got tired of plugging and unplugging cables and designed a box with a big switch to change the connections between different devices. These became known as "A-B boxes" because those were the alternatives they presented.

Recently, I became tired of plugging and unplugging cables from the many modems sitting on top of my computer and decided to investigate the availability of A-B Boxes for RS-232C cables.

My favorite "wish book" for this kind of device has become the Black Box Catalog (PO Box 12800, Pittsburgh, PA 15241). This catalog lists 31 models of switches able to change RS-232C, parallel printer and coaxial cables.

The MFJ RS-232 Transfer Switch switches between two RS-232 devices and presents a visual display of the status of the individual signaling lines. The unit can also swap lines 2 and 3 with a push of a button.

These devices, however, are not inexpensive. A simple two-position RS-232C switch has a list price of $107.50. Somehow, I thought there had to be a less expensive way to do it.

Martin Jue at MFJ Enterprises in Starkville, MS, has been making small peripheral devices for the radio, video and sound industries since 1976. He recently released an A-B switch box for RS-232C cables with some special features and a special price.

The MFJ RS-232 Transfer Switch has a series of LEDs on the front panel that provides you with a visual indication of the status and activity on the most important RS-232C lines. Additionally, the push of a button can swap lines 2 and 3 on the cable to meet the needs of various wiring combinations. MFJ sells this attractive device for $79.95.

A two-way RS-232C switch has a couple of nice applications. If you have added one of the low-cost 1200-baud UDS 212LP modems to your old 300-baud modem, this switch will allow you to move quickly between them. It can also be used to switch the line between two devices, such as the Hayes Smartmodem and Hayes Chronograph.

The MFJ transfer switch has been useful as a troubleshooting device. I have a constantly-changing mix of hardware and software moving across my desk and sometimes it doesn't seem to want to talk together. The status indicators on the transfer switch tell me if the data is really going both ways; they also reveal the status of the "data set ready" and "clear to send" lines.

The only other device I've seen that's capable of providing the features found in the MFJ Transfer Switch costs more than $200, so at $79.95 the MFJ device is a bargain. And the folks at MFJ are working on a switch box with two input and two output ports and they plan to continue to expand their line of switching devices. (Martin, we need something that provides easy jumpering of various pin combinations.)

You can write to MFJ Enterprises at 921 Louisville Road, Starkville, MS 39759, or call 800-647-1800.

Softerm

If you've been following this column, you know there are a few data communications programs I consider superior to the rest. My honor roll includes Omniterm for TRS-80 computers, Crosstalk for CP/M and IBM systems and the Professional series from Southwestern Data Systems for Apple II machines.

Well, these folks are going to have to make room on the honor roll. I've found another program I think does things right: Softerm, a smart terminal program from Softronics in Memphis, TN.

Softerm's main attraction is its ability to pretend to be one of the 13 most popular commercial asynchronous communications terminals.

The version of Softerm I saw emulates the most common character-oriented terminals, such as the DEC VT-100, Hazeltine 1400, Lear Siegler ADM-3A and Televideo 910. Softronics is working on command files for block mode terminals such as the IBM 3101, DEC VT-131 and others.

Terminal emulation will work to your advantage if you communicate with mainframe systems. Many mainframe programs are written specifically to address a certain kind of terminal. They take advantage of the features of this terminal and use cursor addressing (movement on the screen), reverse video and specially-designated keys to improve the presentation and exchange of data.

"Dumb" Terminal?

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The Bank Box remote banking terminal from the Microperipheral Corporation can receive graphic images from a host system at 1200 baud. It is designed to sell in quantity for less than $100.

may miss some of these benefits in the best case and be faced with some strange control characters on the screen in the worst case.

Softerm comes with special files containing the commands needed to do the terminal simulation. Most commercial terminals can display 80 characters on a line, but the Apple II is usually limited to half of that width.

Softerm works around this by providing horizontal scrolling capability. You can see the first or second set of 40 characters in an 80-character line.

Similarly, commercial terminals have many special function keys capable of providing simple entry of unique commands. Keys on the Apple II keyboard have to do double and triple duty to simulate this capability.

Apple Substitute

Using the Apple II as a substitute for a special terminal is more complex than using the terminal itself, but the added operator workload is worth it in order to gain the ability to use special programs and displays.

Softerm also features powerful and flexible file transfer and manipulation capabilities. The program includes a special error-detection and correction protocol allowing Softerm-equipped machines to exchange any type of Apple II file. Softronics plans to provide a version of this protocol in Fortran 77 so users of mainframe computer systems can exchange data with Softerm-equipped Apples.

This sounds as if the tail is wagging the dog, but it may be one answer to the problem of software and data file portability between small and large systems.

Local disk files can be manipulated in many ways while the program stays on line with a host system. The user can read files, format them and execute many of the disk commands while staying on line. The program pages data files through a buffer, so it is not limited by the size of the buffer space available.

The number and type of options for the transmission of files are extensive and should allow you to send information to and through a complex jumble of value-added carriers and information utilities.

Command Control

The file transfer modes of operation are controlled by the use of 22 different commands. The command verbs actually make up a high-level control language unique to the Softerm program.

This is in contrast to the purely menu-driven method of operation most communications programs use. Softerm has menus that provide a listing of the options when you need it, but they are few in number.

The commands include Connect, Dial and Hangup for modem control, and Send, Receive and Speed for file transmission.

Speed is a command that performs what I refer to as the "throttling function." The Softerm manual calls it "transmit speed attenuation," but I won't argue over terms; it's a useful command that allows you to insert a slight delay between transmitted characters to allow information carriers and utilities to keep up.

Often, the complex process of computers moving information cannot handle a prolonged full-speed transmission of data. Softerm allows you to insert a pause in increments of 520 μs between characters to provide the receiving system with some breathing room. This method of throttling the throughput of the system can solve some otherwise puzzling communications problems.

Softerm also provides for prompted transmission to host systems. Many hosts want to signal for the next line of data and text. If your program transmits before the host is ready, the data may be lost.

A surprising number of programs do not provide for prompted transmission. Softerm allows full definition of the prompted characters the program looks for before transmitting a line.

The Softerm program can be used with a large number of 80-column display boards and communications cards. It contains the routines needed to automatically interface with the Hayes Microcomputer Products Micromodem II and the Novation Apple-Cat. You can use most of the common communications cards on the market and you can use macro keyboard codes to communicate with a Hayes Microcomputer Products SmartModem.

Head of the Class

The documentation for Softerm is in the same class with the best (Omniterm and Z-pro). Its table of contents, glossary and index are thorough and the text is professional.

Softerm is a complex program; it's more complicated to use than most terminal software. An inexperienced person starting the program for the first time probably would need some help. Once it is configured, a clerical person could use the Apple as a terminal, but operation still wouldn't be as simple as using the real terminal.

I rate the program highly, however, because it's complete, flexible, well-planned and well-documented. It provides a capability that the Apple II simply wouldn't have otherwise.

Softerm carries a list price of $150. Contact Softronics, 6626 Prince Edward Place, Memphis, TN 38139 (phone 901-755-5006) for more information.

Tale of Three Terminals

There is enough room in the world of data communications to allow for many kinds of equipment and users. In this section, I'll describe three very different terminal devices capable of extending communications into homes and offices.

Bank Box

The Bank Box doesn't *look* like a terminal—it looks more like a telephone dialer with a large keypad.

Actually, it's a unique device combining the best attributes of 1200-baud service with low-priced technology and color graphics.

The Bank Box contains a CPU, screen memory, an eight-color video controller for screen management, an integral

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Novation's Infone is a portable terminal with startling versatility. It functions as both a telephone device and a data terminal. The slim device shown here is actually a telephone handset.

1200-baud direct connect modem and a built-in rf modulator for a color television signal. It was developed by the Microperipheral Corporation as a low-cost, high-speed alternative to home computers for electronic banking in the home.

The user can connect the Bank Box to a telephone and a television set and use the device to pay bills, check account balances and receive banking information in the home or office. Optional devices, such as a magnetic strip scanner, can be added to the Bank Box to convert it into a point-of-sale terminal or home shopping device. It's significant that this device is designed to sell in quantity for less than $100.

The Bank Box receives data at 1200 baud using a simple frequency modulation scheme. This relatively high-speed transfer from the host to the terminal is needed to produce the color graphic video displays.

Since the information going from the Bank Box terminal to the host is small in quantity and slow in speed, a dual-tone signaling scheme is used in this direction. This combination keeps the technology simple and the cost low.

The power of the Bank Box comes from the programs in the host computers it interfaces with. You can expect to see it becoming available through aggressive financial institutions across the country.

The Microperipheral Corporation can be contacted at 2643 151st Place, Redmond, WA 98052 (phone 206-881-7544).

Infone

Novation first displayed a prototype Infone about two years ago. Since that time the company has been making changes to bring it to a mature product.

The Infone is a portable terminal featuring a full-size keyboard, built-in modem, RS-232C serial port and 40-character, single-line liquid crystal display. That sounds nice, but it's not spectacular, so Novation added a CPU with 32K of internal terminal support ROM, 6K of RAM for messages, a cassette interface for saving messages, a Weitbrecht modem for use on deaf teletypewriter networks and a 1200-baud modem using Bell 202 signaling.

If you still aren't satisfied, note the slim telephone handset that allows you to use the Infone as a speakerphone device, a clock, a calendar and a BSR controller that lets you control lights and appliances through the Infone.

Novation fits all of these features into one 7 x 10 package that weighs around two pounds.

The Infone can be used at home as a standard communications terminal for information utilities or deaf communications systems. One use of the BSR controller is to flash lights if there is an incoming data call. Infone will autoanswer these calls and capture data in its buffer or in an auxiliary tape recorder.

Message Storing

As a portable terminal, the Infone can be used to create and store messages even when no communications connection is available. The stored messages can be transmitted from any telephone through the use of a portable and adaptive acoustic coupling device. The internal rechargeable nicad battery can provide up to 90 minutes of operation.

The Infone contains several programming options, including autodialing from a telephone directory that you create, a time and date reminder, an activity calendar and the ability to edit messages in the buffer. The Infone's accessories include an over-the-shoulder carrying bag and a printer.

You can write to Novation at 18664 Oxnart St., Tarzana, CA 91356 (phone 213-996-5060).

RCA VP-3501

The third interesting track in modern terminals is a return visitor to this column.

The RCA VP-3501 videotext data terminal has stirred up a lot of interest in the large system user world of data communications. This terminal is unique because it's so capable.

It has the full ASCII character set, including some of those funny brackets and break signs you need to enter data into mainframe terminal data files. The keyboard can be used to enter all of the nonprinting ASCII codes needed for control operations.

The VP-3501 has an internal modem, RS-232C port and interface to a cassette for recording data. This recorded data can be played back later when you are off line and not paying connect charges. The VP-3501 has an accessory interface for a printer or CPU/memory device.

I usually keep the VP-3501 hooked up to a television set and use it as a terminal for checking the UPI news on the Source. (You get a much different picture of the news when you read the wire service dispatches than when you watch the predigested stuff they feed you on television.) It is much easier to use the VP-3501 for this activity than to fire up a complete computer system.

I also have used the 3501 as a color video display device during demonstrations and computer classes. I use my TRS-80 at home as a host device and dial into it with the VP-3501.

I run Basic programs in the TRS-80, providing the graphics directions to the VP-3501. In this way I don't have to carry bulky disk drives and large computer/memory combinations with me, but I can have interactive color graphics video displays anywhere I can set down a television set and find a telephone line.

The RCA VP-3501 has served me well as an interactive terminal device. I know RCA intends to expand their terminal line and provide even more ways to enter the world of data communications. Contact RCA Microcomputer Products, New Holland Ave., Lancaster, PA 17604.

A Bright Future

There are many things happening in the world of data communications. We have more ways to get on-line, and there are significant improvements in the information systems we can get on-line with. Banking, information retrieval and data exchange are all activities we will perform increasingly in our homes and on the road.

The fourth year of coverage here in the Dial-up Directory should be as interesting as the first three. Stay with us!□

WHAT'S NEW, BIG BLUE?

By Thomas V. Bonoma

An Answer For Any DB Job

Is IBM's Basic Bug-Infested?

It's a new year, or will be soon (depending on when you get your subscription).

Let me be one of the first to wish you a happy new year. I'll also take this opportunity to thank you for the mail, the Source messages and your help during the past few months. Remember, if you want a reply from me, either write me on the Source (TCD292) or send a self-addressed, stamped envelope.

Much of the mail I've received comes from prospective users who want to know how to configure the PC they're about to buy. We'll take a look at that issue in a future column and, given the interest expressed, I'll try to devote more time to hardware as well.

This month we'll take an in-depth look at The Answer, a new filing-card program for the PC. Additionally, I'll review some other programs more briefly, including Home Accountant Plus, Financial Management System II and the Personal Computer Home Management System. Volkswriter, Proofreader, Grammatik and a new text editor from Intellect Associates will be examined too.

On the programming/tutorial side I'll report not only on a possible bug in Basic, but on a working, PC-tailored version of a critical-path program for you to key in; it will provide some programming utilities you might want to adapt for other applications.

The Answer

I confess that the last piece of software I wanted to look at in this world was another database-type program. We've already looked at some Cadillacs among the DBMS genre (like Condor) in this column. Additionally, some other good software exists, from the simple but functional type (DMS by Intellect Associates is about the best of these) to the full-blown type (Information Unlimited Software's EasyFiler, for example; it's $400 but includes outstanding report-generating capabilities).

I'll be reviewing these and other DBMS programs in a future column, so when I obtained an advance copy of The Answer ($250 from North American Business Systems or from your dealer), I wasn't so eager to review it.

Well, you're talking to a convert. The Answer is superb—for the businessperson, professional or hobbyist. It's just the right program to do almost any database job!

The Answer is an electronic filing-card system coded in PC Forth. It's supplied on four disks, only one of which contains the program logic; the other three make up a complete set of computer-aided instructions which actually run the program to show you how to use it.

The program allows you to design as many different "forms" (ten-line electronic cards) as you want in free-form fashion. The Answer also has an outstanding forms editor; you can flash, reverse video or highlight any part of the cards, including the data with which you later fill out your forms.

For all intents and purposes, the number of cards you can have equals the number of disks you can buy to stuff data on—no limits here. There are no real limits, either, to the number of "keys" (25 allowed on each form) or fields on which you'll ask to retrieve the information.

And, when the data has been sorted, you can browse through it (much like in DBase II) to your heart's content. So far we've got a competent but mundane DBMS.

Cross-referencing

So why am I a convert? Cross-referencing, that's why. The Answer lets you cross-reference any card to any other card. If you have a card file of "people" contained in your Rolodex, for instance, and another one of "products" you sell, and another one of "background" you know about people, products and other things, you can tie together all three (or 30) card banks electronically.

The result is that you can call up the card on your friend Joe and see that he likes electric drills and has two kids in high school. The possibilities are awesome!

So far, I've loaded up five disks with information I used to keep in bits and pieces. The opportunity to call up just one piece, and then to have the computer "remember" all the other linkages, is great.

Imagine putting your appointment calendar on the program (an Answer-suggested application) and then being able to find out which of your services each person you were meeting that day might be interested in, how much he owed you or what personal things you knew about him. And since the program splits the PC screen into halves, you can have two cards on the screen at one time to examine these and other linkages.

The Answer is one of those programming concepts so simple that you ask yourself why you didn't think of it. That, it's been said, is one of the tests of a great idea.

You may not want to plunk down $250 without knowing more. Contact the North American people at 677 Craig Road, St. Louis, MO 63141, or call 1-800-325-1485, and they'll send you a free disk with an Answer demo on it. That's the way all software should be sold.

Perfection is Consuming

Are there shortcomings to the system?

Yes, and you should know about them. First, there is no "report generator" on The Answer. You can print out, for example, all kinds of rudimentary reports, but

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you can't really tailor your data in a way you'd like.

Of course, by the time you read this, there should be a report generator available to go with The Answer; that will remove one big problem. Second, since Forth (the language in which The Answer is coded) only believes in one giant record (no matter what you write out to the disk), entering data involves an enormous amount of disk-accessing as the database grows toward the limits of each disk's capabilities.

It takes about two minutes to add a record on a 100-record database; it takes only ten to 15 seconds for a 50-record database. And sorts, which are necessary in order to use the advance browsing capabilities of the program, must be done each time you end a session involving added or deleted cards.

To sort, you have to leave the main program and go into a utility program. That's inconvenient; it should have been automated.

Actually, though, the most severe problem in my mind is that The Answer is so useful that after getting it, you'll find yourself wishing for a hard disk to get you out from under all the cardfile floppies you've created.

Other Software

Volkswriter

The Volkswriter ($195 from Lifetree Software, 177 Webster St., Suite 342, Monterey, CA 93940) is another major league piece of software that can handle about 75 to 90 percent of most writers' word processing needs.

The Volkswriter's function keys, hardware and abilities are tailored closely to those of the PC. In addition, the Volkswriter features good design, simplicity and ease of understanding (you really don't need to read the manual). And if you can do without some of those features others need (headers, footers or the ability to insert footnotes or to print form letters), it may be the ideal PC word processor for you. (VW version 1.2, which supports serial printers, has just been released.)

You should plan on having 128K of memory, however, despite the fact that VW will run on 64K. It will run, but it sure won't store much.

Proofreader/Grammatik

You're sold, you say. You know that a program like VW is right for you; you'd never get through that WordStar manual but you absolutely have to have a spelling-checker. Well, the Aspen Software people (PO Box 339, Tijeras, NM 87059) have two programs for you.

Proofreader and Grammatik are the best spelling-checkers I've ever seen, and that includes SpellStar and even Spellguard. You can buy Proofreader and Grammatik separately, although you shouldn't because they interact. The package price is $125.

Proofreader uses a 50,000-word version of the *Random House Dictionary of the English Language* to check your text; it can also use an auxiliary dictionary. That's nothing new, but what *is* novel is that it will search your file quickly and display or print the unknown words, save them in a special file and pass you on to a special "proof-edit" program.

Here's where we get to the blue smoke and mirrors. Proof-edit lets you interactively correct the boo-boos you've made.

Most spelling correction programs mark the words that are wrong, but you *still* may not know how to spell them. Proof-edit will look them up in the dictionary and display all the words near in spelling to the one you've fudged. That's what a spelling corrector is supposed to do.

We're not done yet, though, because you can pass control to Grammatik, which is as tough on your style as that 63-year-old lady you used to have in 11th-grade English Composition.

Grammatik checks your work for awkward constructions, slang and informal usage ("ain't"), sexist terms (if you choose) and a multitude of other style problems. It also proposes corrections.

Both programs support a WordStar mode, which reads and writes WordStar files. The only reason you shouldn't go right out and get this package if you're a writer is if you have a fragile ego. I know I sweated a whole lot when I let Grammatik look over this here column.

Window

Maybe you don't need or want a word processor, but you're so dissatisfied with Edlin that you wish you did have one. If so, you should look at Window (Intellect Associates, Inc., PO Box 365, Holbrook, NY, 11741, $150), a full-screen text editor for the PC.

Window is user-friendly, makes extensive use of the screen and keyboard capabilities of the PC (including Scroll Lock) and, whenever possible, gives you single keystroke control over all its functions. Window is designed to be a programming editor. Write your programs with Window, using the fancy editing capabilities, and then save them for running. It's fast, solid and creates standard ASCII files that can be used as input to almost any language.

Three Home Management And Accounting Programs

Lo and behold—three home management or accounting programs for the IBM PC: PCHMS (Personal Computer Home Accounting System, $89.95 and $2.50 shipping from Arlington Software Systems, 97 Bartlett Ave., Arlington, MA 02174), Financial Management System II, with Checkwriter ($89.95 from

Computerized Management Systems, 1039 Cadiz Drive, Simi, CA 93065) and the Home Accountant Plus ($150, Continental Software, 11223 S. Hindry Ave., Los Angeles CA 90045).

How do you know which one to buy, if any? Are they all the same?

PCHMS won't balance your checkbook, but it will keep track of names, addresses, telephone numbers, credit cards, insurance records and up to nine user-defined files. In addition, it has a printing calculator option, a memo writer to leave notes on the display, a metric converter, a world time zone computer, a 20-year calendar and some space for you to input information such as state abbreviations and zip codes.

If that isn't enough to keep you busy, PCHMS has a date function and digital clock (with alarm), it can be secured with a password and it makes good use of the PC's color abilities in colors you choose in a configuration program.

PCHMS is written in Basic and can be expanded with an optional auto-dialer modification so that your address book will also dial the phone. It's also list-protected, well-documented, fast and configurable to your system and color preferences.

One generic problem with programs of this sort, however, is that even if you dedicate your computer to PCHMS and leave it on all the time, you probably won't be able to get near your computer when you need a name or address, or if you need to know how much 1.17 liters is in quarts.

FMS II and Home Accountant Plus have similar concepts but distinctly different executions. Both programs are what might be called home or even small business accounting programs—that is, checkbook managers, budget devices and financial planning tools.

FMS II, the less expensive of the two systems, focuses on completeness in checkbook and expenditure tracking. Multiple checking accounts can be supported, as can up to 100 categories of expenditures (or tax codes). A system of "macros," or abbreviations, is supported, so that the user need only enter AE for Al's Electronics Shop, for example.

A fairly standard search and retrieve ability is supported, as is a budgeting tracker and planner for any 12-month period. The programs written in Basic (protected) and the implementation (including the ability to write machine-printed checks) are well-designed and apparently bug-free.

Home Accountant Plus (Version 1.3) does all that in addition to bringing fancier financial planning options and graphics to the budget party. HAP will print a personal balance sheet for you, a net worth statement, line or bar graphs for any budget category and even do some trend analysis.

Additionally, the program provides elementary forecasting abilities, such as a future value generator, a future goal planner ("I want to have $100,000 in the bank in 20 years—how much do I need to save each year if I use a 15 percent rate of return and a 9 percent inflation rate?"). HAP is programmed in Basic and is supplied with good documentation and screen examples.

Shortcomings include HAP's single precision math, which loses one to two cents on amounts higher than $10,000 and also loses everything to the right of the decimal on amounts higher than $100,000. And, while you can graph any budget category, you can't print that graph without saving it first and then using a self-supplied graphics print routine to get the graph out. It's grossly inconvenient and hardly useful.

Continental is planning a new version to fix the single-precision problem, but promises only to "notify" current owners when the new version is available.

Otherwise, choosing between FMSII and HAP is a matter of what you want to do with your home finances (I would not recommend either system for a small business with more than $100,000 in annual revenues), and the thickness of your wallet.

Both programs offer value for the money, but I have an easier time justifying FMSII until Continental integrates its graphics and fixes its precision problems.

There is another consideration before you rush out and get either program: Will you use it?

The major task in using either program, as HAP points out in its documentation, is getting all of your records together in the first place. If you do that, both of these programs will pay for themselves before you ever turn on your computer.

```
10 ' Fracdec:  A program to convert fractions to decimals
20 '     From:  Creative Computing, October, 1982, page 154
30 INPUT "Enter a fraction: ";A$:PRINT
40 DIM Q(99), RM(99)
50 '     r=remainder, d=denominator, q=digits of answer
60 R=VAL(A$):Z=LEN(STR$(R))+1:D=VAL(MID$(A$,Z))
65 '   Here's the bug!  Program line 60 was originally (and
       correctly) written as R=VAL(A$):Z=LEN(STR$(R))+2...etc.,
       which of course it
       should be if what you want to get in Z is the denominator.
67 '   That is, in 1/3 the denominator is in the third "slot"
       counting from the left.  But, good old BASIC (including
       BASICA and ROM-BASIC) *adds* a space when you use the STR$
       function as an argument to LEN, so that
68 '      LEN(STR$("3")), obviously 1, becomes 2.  This is because
          STR$, when called by LEN, *adds* a space to the string
          conversion, so that "3" becomes *3, where the * is a
          space (ASCII 32).
69 ' Regular old STR$ generates this extra space too, but it's
     only a problem when length is of concern.
70 PRINT A$;" = ";
80       IF R<D THEN 100
90       A=INT(R/D):PRINT A;:R=R-A*D
100      R=R*10
110 FOR L=0 TO 99
120 IF R=0 THEN L=L-1:GOTO 170
130 RM(L)=R:Q(L)=INT(R/D):R=10*(R-Q(L)*D)
140      FOR L2=0 TO L:IF R=RM(L2) THEN FL=1:GOTO 170
150      NEXT L2:NEXT L:PRINT "no repetitions in first 100 digits"
160 '*************************************************************
170 IF L=-1 THEN 210
180 PRINT ".";
190      FOR Z=0 TO L: IF FL AND L2=Z THEN PRINT "(";
200      PRINT RIGHT$(STR$(Q(Z)),1); :NEXT Z: IF FL THEN PRINT ")";
202 ' The fact that we used STR$ above, which generates leading
      spaces, means that we can't just output Q(Z) in line 200,
      as we'd like.  If you do, you'll find that all the values
204 ' stored in array Q are stored as *N, where * is a space
      and N the number.  That, of course, gives you output which
      looks like:       1/7 = . 1 4 2 8 5 7 etc.
210 PRINT:PRINT:END
```

Listing 1. Fractions to decimal equivalents program for the IBM PC.

Basic Bug?

While reading another computer magazine this month, I came across a clever program (written by a high school student) that converts fractions to decimal equivalents. I was surprised to find that, after keying in the program and checking the entries, it wouldn't run without some modifications.

The modifications pointed to a possible bug in Basic (maybe it's not a bug, and maybe it's not new, either). I've tracked it through the various Basic dialects and can confirm it for ROM-based and disk-based Basic, as well as BasicA.

Try Listing 1 on your machine, both as it is now (it works fine), and with line 60 as originally given by the programmer. See if there's a bug, or if I've got a haywire piece of hardware. Let me know (Source TCD292) what you find out.

Ordinarily, I'd be embarrassed to point out what may be simply a flaw in my own system or in my understanding of Basic. But of all the vendors I've dealt with in doing this column, none have been *less* cooperative than the folks at IBM in

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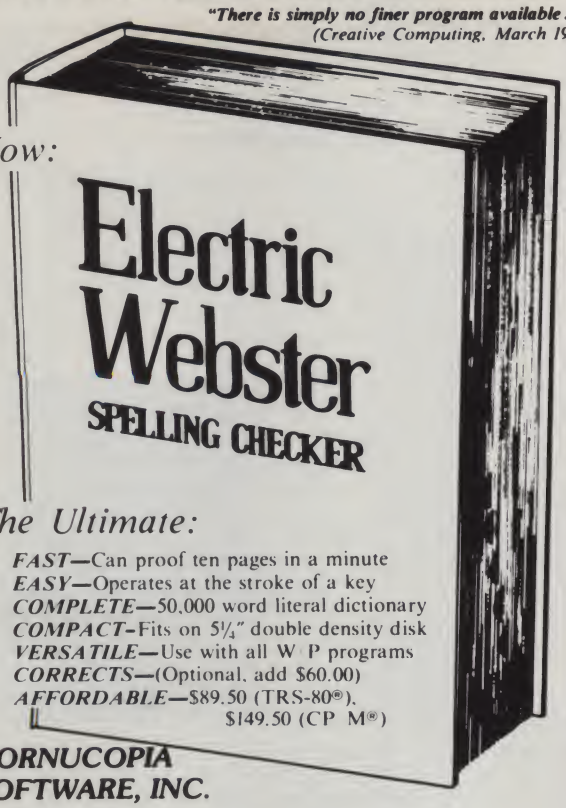
(Creative Computing, March 1982)



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Listing 2. PERTCHT.BAS—a critical path scheduling program.

```
    Time:  15:20:35                    Date:  09-18-1982

                        Program PERTCHT.BAS

                Adapted for the IBM PC by Thomas V. Bonoma

                Computes Critical Event Paths and Schedules
```

```
10 '    PROGRAM:  ENHANCED PERT          SOURCE:  BYTE, MAY, 1982, PP. 469ff.
20 '    FUNCTION: PERT CHARTING          DATE:    5/1/82
30 '    VERSION:        1.1              AUTHOR:  T. V. BONOMA
40 '
42 SCREEN 0,1,0,0:WIDTH 80
45 DEFDBL M,X,P
47 KEY OFF
50 CLEAR 5000:CLS
60 COLOR 5,0,5:LOCATE 1,23: PRINT "PERT/CRITICAL PATH SCHEDULING"
70 LOCATE 3,23:COLOR 7: PRINT "ORIGINAL BY S.M. ZIMMERMAN/L.M. CONRAD"
80 LOCATE 5,23: COLOR 9: PRINT "MODIFIED AND ADAPTED FOR THE IBM PC BY"
90 LOCATE 7,23: COLOR 15:PRINT "THOMAS V. BONOMA     MAY, 1982"
100 COLOR 7,0,0:PRINT:PRINT"Note:  Beginning Events will be sorted numerically"
105 LOCATE 12,1
110 FOR I=1 TO 16:FOR J=1 TO 15:Q=J:IF Q>15 THEN Q=0
115 COLOR Q:PRINT CHR$(1);:NEXT J:NEXT I
120 DIM A$(500,2),A(500,11),SV(11)
130 CLS:LOCATE 5,25:COLOR 15,0,0:PRINT "MENU FOR INPUT CHOICES"
135 FOR HOLDIT=1 TO 700:NEXT HOLDIT
140 COLOR 7,0,8:LOCATE 7,20:PRINT "K - Keyboard"
150 COLOR 3:LOCATE 8,20:PRINT "D - Disk File"
160 COLOR 11:LOCATE 9,20:PRINT "R - Read Statements Already in Program"
170 LOCATE 14,40: COLOR 15,0,0:INPUT "What is your selection  ";IO$
175 IF IO$<>"D" AND IO$<>"R" AND IO$<>"K" AND IO$<>"d" AND IO$<>"r" AND IO$<>"k"
      THEN 130
180 COLOR 7,0,0: IF IO$<>"K" AND IO$<>"k" THEN 360
190 CLS:LOCATE 5,5:INPUT "How many different tasks do you have  ";M%:EE=0
200 COLOR 4,0,9:PRINT:PRINT "OK...let's enter them one at a time.  For each, we'
11 want"
210 PRINT " an activity code, a description,  a beginning and ending 'event "
220 PRINT "number', and optimistic and pessimistic completion estimates."
230 COLOR 2:PRINT:PRINT "Hit any key to enter data:  ":COLOR 7,0,0
240 TR$=INPUT$(1)
250 CLS:COLOR 3,0,0:LOCATE 1,35:PRINT "DATA ENTRY ROUTINE"
260 COLOR 15,0,0:LOCATE 3,5:PRINT "Code":LOCATE 3,10:PRINT "Descript.":LOCATE
      3,25:PRINT "Begin?":LOCATE 3,35:PRINT "End?":LOCATE 3,42: PRINT "Optimis
tic":LOCATE 3,55:PRINT "Likely":LOCATE 3,64:PRINT "Pessimistic"
270 X=4:COLOR 7,0,0
280 FOR I=1 TO M%
290 LOCATE X,7:INPUT "",A$(I,1):LOCATE X,11:INPUT "",A$(I,2):LOCATE X,27:INPUT
     "",A(I,1):LOCATE X,36:INPUT "",A(I,2):LOCATE X,47:INPUT "", A(I,3):LOCATE
     X,57:INPUT "",A(I,4):LOCATE X,69:INPUT "",A(I,5)
300 X=X+1
340 NEXT I
350 GOTO 460
360 IF IO$<>"D" AND IO$<>"d" THEN 470
370 CLS:LOCATE 5,30:COLOR 14,0,8:PRINT "DISK INPUT ROUTINE"
375 ON ERROR GOTO 15000
380 COLOR 7,0,8:PRINT:LINE INPUT "Name of disk file, e.g., B:xxxxxxx.yyy  ";
      B$:OPEN "I",1,B$
400 INPUT#1, M%,EE
410 FOR I=1 TO M%
420 INPUT#1, A$(I,1), A$(I,2), A(I,1), A(I,2), A(I,3), A(I,4), A(I,5)
430 IF A$(I,1)="END" THEN 540
440 NEXT I
450 CLOSE #1
460 GOTO 530
470 IF IO$<>"R" AND IO$<>"r" THEN 130
475 CLS: PRINT "Reading data from Program...PLEASE WAIT...":COLOR 7,0,0
480 READ M%,EE
490 FOR I=1 TO M%
500 READ A$(I,1),A$(I,2),A(I,1),A(I,2),A(I,3),A(I,4), A(I,5)
510 IF A$(I,1)="END" THEN 530
520 NEXT I
530 'Verify the data which was entered.
540 M=M%: TP=0:FOR I=1 TO M:IF A(I,2)>TP THEN TP=A(I,2)
550 NEXT I:EE=TP
560 FOR I=1 TO M-1
570 FOR J=I+1 TO M
580 IF A(I,1)<=A(J,1) THEN 610
590 FOR K=1 TO 11:SV(K)=A(I,K):A(I,K)=A(J,K):A(J,K)=SV(K):NEXT K
600 FOR K=1 TO 2:SV$(K)=A$(I,K):A$(I,K)=A$(J,K):A$(J,K)=SV$(K):NEXT K
610 NEXT J,I
620 CLS
630 XX=5:COLOR 14,0,0:PRINT TAB(25);"VERIFICATION OF INPUT":PRINT :COLOR 7,0,0
640 Z1$="Code Description   Expected  Early   Early    Last    Last    Slack"
650 Z2$="                    Time     Start    Fin.    Start   Fin.    Time"
660 Z3$="Code      Description          Begin    End    Optimist  Likely  Pessim
ist"
670 Z4$="                               Event   Event     Time     Time      Tim
e  "
680 PRINT "No. ";Z3$
690 PRINT "    ";Z4$
700 K=0
710 C4$="### "
720 FOR I=1 TO M%
730 PRINT USING C4$;I;
740 C1$="  ####  "
750 C2$="\            \":C3$=" ####.## "
760 PRINT USING C2$;A$(I,1),A$(I,2);
770 FOR J=1 TO 2
780 PRINT USING C1$;A(I,J);:NEXT J
```

More

Florida. Even finding someone to talk to down there has been a problem. So, if there *is* a bug in Basic, and even if there isn't, we may at least get their attention!

PERTCHT.BAS

Finally, I'm including a critical path scheduling program I've adapted for the IBM PC.

Essentially, PERTCHT.BAS looks at the number of events or activities which make up a larger job and their starting and ending times; it also looks for places where there is no "slack" in the system. These places form the "critical path" or set of activities which, if delayed, will delay the entire project. Regardless of whether you find the subject useful, however, I think you'll be able to use some of the coding for your own applications.

PERTCHT.BAS is an example of what color text display, user-friendliness and error-checking can do to enhance an otherwise dull bit of coding. (This program runs quite nicely on a monochrome display, but without the pizzaz.)

Listing 2 shows the program, which is titled and boxed by another PC utility I have published here, called TITLIT.BAS. The color theme is carried throughout the program, from the title screen (lines 60-115) to the display of the tasks making up the critical path output, which is the program's main result (in red on the color monitor).

Instead of walking you through the program line by line, I'll summarize the differences, enhancements and unique PC features I was able to implement in doing this conversion, which took a total of six hours in two sittings. (Note: It also took another six hours to rework the program when I destroyed the disk... please back up your disks!)

The Width and Screen statements, plus Color and Locate, which occur throughout the program, can use some explanation. The PC allows the user to select either a software-specified 40- or 80-column display. The screen statement allows the user to select a text screen (Screen 0), a medium-resolution graphics screen (Screen 1) or a high-resolution graphics display (Screen 2).

The medium-resolution graphics display is capable of all 16 colors and is the screen on which the PC's special graphics commands (for example, Paint) operate. The text display screen also displays all 16 colors in three mode variations.

Blue Modes

You can vary the color of the letters or special characters output to the screen, a screen border and a background color (specify Color 7,1 for white letters on a royal IBM-blue background).

CRTs don't use all the screen for output; there's an approximately 3/8-inch border around the text display area which is never written on; it's called the

Listing 2 continued.

```
790 FOR J=3 TO 5
800 PRINT USING C3$;A(I,J);:NEXT J
810 K=K+1: IF K>=20 THEN MSG$="Enter to Page":LGTH=1:ANSWER$="":GOSUB 10000
820 PRINT:NEXT I
830 COLOR 7:MSG$="Please input a -2 to add more, -1 to continue, or number (e.g.
, 03) to change ":LGTH=2:GOSUB 10000:ANSWER=VAL(ANSWER$):L=ANSWER:IF L=-1 THEN 9
05
840 IF L<>-2 THEN 860
850 L=M%+1:M%=L:N%=N%+1:XCHECK=1:GOTO 860
860 IF L>M% THEN GOTO 830:ELSE GOSUB 20000:IF ABORT GOTO 830
870 INPUT "New Code Name/Letter or END to ABORT  ";A$(L,1)
880 IF A$(L,1)="END" THEN GOSUB 22000:GOTO 830
890 INPUT "New Description  ";A$(L,2):INPUT  "New Beginning Event Number  ";
    A(L,1)
892  INPUT "New Ending Event Number"; A(L,2):INPUT "New Optimistic End  ";A(L,3)

898  INPUT "New Likely End  ";A(L,4):INPUT "New Pess. End  ";A(L,5)
900 GOTO 620
905 MSG$="What hard copy of your data  ":LGTH=1:GOSUB 10000:P$=ANSWER$:
      IF P$<>"Y" AND P$<>"y" THEN 1040
910 MSG$="Input a Title, Then Hold Space Bar Till Printer Begins: " :LGTH=40:GOS
UB 10000:T$=ANSWER$:LPRINT "Title:  ";T$
920 LPRINT "DATE:  ";DATE$
930 LPRINT "NO ";Z3$
940 LPRINT "   ";Z4$
950 FOR I=1 TO M%
960 LPRINT USING C4$;I;
970 LPRINT USING C2$;A$(I,1);A$(I,2);
980 FOR J=1 TO 2
990 LPRINT USING C1$;A(I,J);:NEXT J
1000 FOR J=3 TO 5
1010 LPRINT USING C3$;A(I,J);:NEXT J
1020 LPRINT " "
1030 NEXT I
1040 MSG$="HIT ANY KEY TO COMPUTE RESULTS":LGTH=1:GOSUB 10000
1045 LOCATE 25,2:PRINT "WAIT...";
1050 FOR I=1 TO M%
1060 A(I,6)=(A(I,3)+4*A(I,4)+A(I,5))/6
1070 IF A(I,1)=1 THEN A(I,7)=0:A(I,8)=A(I,6):GOTO 1110
1080 MAX=0!
1090 FOR J=1 TO M%
1092 IF A(J,2)<>A(I,1) THEN 1098
1094 IF A(J,8)>MAX THEN MAX=A(J,8)
1096 A(I,7)=MAX
1098 NEXT J
1100 A(I,8)=A(I,7)+A(I,6)
1110 NEXT I
1120 'Backward pass?
1130 XM=0!
1140 FOR I=M% TO 1 STEP -1
1150 IF A(I,2)<>EE THEN 1170
1160 IF XM<A(I,8) THEN XM=A(I,8)
1170 NEXT I
1180 FOR I=M% TO 1 STEP -1
1190 IF A(I,2)=EE THEN A(I,10)=XM:GOTO 1260
1200 MIM=999999!
1210 FOR J=M% TO 1 STEP-1
1220 IF A(I,2)<>A(J,1) THEN 1250
1230 IF A(J,9)<MIM THEN MIM=A(J,9)
1240 A(I,10)=MIM
1250 NEXT J
1260 A(I,9)=A(I,10)-A(I,6)
1270 NEXT I
1280 'Slack variable calculations
1290 FOR I=1 TO M%
1300 A(I,11)=A(I,10)-A(I,8)
1310 NEXT I
1320 CLS:K=0     'print the output
1325 COLOR 14,0,0:PRINT TAB(35);"RESULTS":PRINT:COLOR 7,0,0
1330 PRINT "Code        Description         Expected  Early  Early    Last   Last
  Slack"
1340 PRINT "                                  Time     Start  Fin.     Start  Fin.
  Time"
1350 C5$=" ###.## "
1360 FOR I=1 TO M%
1370 IF A(I,11)=0 THEN COLOR 4 ELSE COLOR 7
1380 PRINT USING C2$;A$(I,1),A$(I,2);
1390 FOR J=6 TO 11
1400 PRINT USING C5$;A(I,J);:NEXT J
1410 PRINT:K=K+1:IF K=20 THEN MSG$="Enter to Page  ":LGTH=1:GOSUB 10000:ANSWER$
      =DU$:K=0
1420 NEXT I
1430 MSG$="Hard Copy of Results  (Y/N)  ":LGTH=1:GOSUB 10000:P$=ANSWER$:
      IF P$<>"Y" AND P$<>"y" THEN 1490
1440 LPRINT " ":LPRINT Z1$:LPRINT Z2$
1450 FOR I=1 TO M%
1460 LPRINT A$(I,1);"   ";:LPRINT USING C2$;A$(I,2);
1470 FOR J=6 TO 11:LPRINT USING C5$;A(I,J);:NEXT J
1480 LPRINT "    ":NEXT I
1490 CLS:COLOR 15,0,0:LOCATE 5,30:PRINT "OUTPUT MENU":COLOR 7,0,0
1500 COLOR 4:LOCATE 7,20:PRINT "C - Critical Path and Time":COLOR 6
1510 LOCATE 8,20:PRINT "D - Disk":COLOR 13
1520 LOCATE 9,20: PRINT "E - End":COLOR 7
1530 LOCATE 10,20:PRINT "R - Recycle"
1540 LOCATE 20,35:COLOR 15,0,0:INPUT "Choice, please...  ";OP$: IF OP$="R"
      OR OP$="r" THEN 530
1550 IF OP$<>"C" AND OP$<>"c" THEN 1720
1560 'identification of critical path and costs
1570 CO=0:PATH$=" ":SI=0
1580 FOR I=1 TO M%:IF A(I,11)>.000001 THEN 1600
1590 CO=CO+A(I,6):PATH$=PATH$+" --> "+A$(I,1):SI=SI+((A(I,3)-A(I,5))/6)^2
1600 NEXT I: C6$="###,###,###.##":SI=SQR(SI)
1610 CLS:LOCATE 5,30:COLOR 4,0,0: PRINT "CRITICAL PATH":PRINT PATH$:PRINT:
      COLOR 7,0,0
```

More

Listing 2 continued.

```
1620 PRINT "Time of Critical Path  ":PRINT USING C6$;CO:INPUT "Scheduled Project
 Time (use same time units as data)  ";ST:Z=(ST-CO)/SI:XX=0
1630 BB$="Probability of being completed on time  ": IF Z<0 THEN 1670
1640 A=.4361836:B=-.1201676:C=.937298:D=(2.7182818#^(-Z^2/2))*(2*3.1415926#)^
       (-.5):E=(1+.3326*Z)^(-1):P=1#-D*(A*E+B*E^2+C*E^3):IF XX>0 THEN 1660
1650 COLOR 12,0,4: PRINT USING "Z= ##.###      ";Z;:PRINT BB$;:PRINT USING "#.###
";P:COLOR 7,0,3:GOTO 1680
1660 PRINT USING "Z= ##.###     ";-Z;:PRINT BB$;:PRINT USING "#.###";1-P:COLOR 7:
       GOTO 1680
1670 XX=99: Z=-Z:GOTO 1640
1680 MSG$="Hard Copy  (Y/N)  ":LGTH=1:GOSUB 10000: P$=ANSWER$: IF P$<>"y"
       AND P$<>"Y" THEN 1490
1690 LPRINT " ": LPRINT "CRITICAL PATH":LPRINT PATH$:LPRINT " ":LPRINT "SCHEDULE
D PROJECT TIME IS  ";ST
1700  LPRINT "Time of critical path ":LPRINT USING C6$;CO: IF XX=0 THEN LPRINT "
Z= ";Z;"     ";BB$;P:GOTO 1490
1710  IF OP$="E" OR OP$="e" THEN END
1720 IF OP$<>"D" AND OP$<>"d" THEN 1770
1730 LINE INPUT "Name of disk:file  ";X$:OPEN "O",1,X$
1740 PRINT#1, MX,EE
1750 FOR I=1 TO MX:PRINT#1,CHR$(34);A$(I,1);CHR$(34);",";CHR$(34);A$(I,2);
       CHR$(34);A(I,1);A(I,2);A(I,3);A(I,4);A(I,5):NEXT I
1760 CLOSE #1: GOTO 1490
1770 SCREEN 0,0,0:WIDTH 80:COLOR 9,0,0: PRINT "ENDING...";:COLOR 7,0,0:
       FOR I=1 TO 1000:NEXT: KEY ON: END
1775  DATA 18,9
1780 DATA "A","ACCT. PAPERS",1,2,1,2,3
1790 DATA "Z","PERMITS",2,7,4,5,8
1800 DATA "B","SHOP BANKERS",1,3,2,4,6
1810 DATA "C","SHOP REAL EST.",1,4,2,13,17
1820 DATA "D","MARKET STUDY",2,3,2,4,5
1830 DATA "G", "CONTRACTOR", 2,5,1.4,2.2,6.7
1840 DATA "H","ART PLANS", 3,5,2,4,6
1850 DATA "E","COST STUDY",3,4,3,4,5
1860 DATA "I","LAND", 4,5,8,11,13
1870 DATA "J","MATERIAL",5,6,2,3,4
1880 DATA "K","PLANS", 5,7,2,5,12
1890 DATA "L","SURVEY", 5,8,1,2,4
1900 DATA "M", "BUY MAT #1", 6,8, 2,3,4
1910 DATA "O", "BUY MAT #2", 6,9,1,2,5
1920 DATA "N", "LAYOUT", 7,8,9,11,12
1930 DATA "P", "FOUNDATION", 8,9,1,3,6
1940 DATA "Q", "HIRE CREW 2", 7,9,1,2,3
1950 DATA "F", "INSURANCE", 2,6,.4,1.3,1.5
10000 ' This subroutine saves the cursor position as ONCE (Col. or Y) and
10010 ' WAS (Row or X), locates the cursor on the 25th status line, gets an
10020 ' input value (string only), and returns the cursor to where it
10030 ' ONCE WAS.
10040 '          Input variables:  MSG$;  Output : ANSWER$
10050 '                                           LGTH of desired answer
10060 ' Store cursor position
10070 ONCE=CSRLIN
10080 WAS=POS(0)
10090 ANSWER$=""                    'empty the answer string
10100 ' Make sure softkeys are off, locate cursor on 25th line
10110 KEY OFF
10120 LOCATE 25,3
10130 'Print the message user requests and get an input
10140   PRINT MSG$;:ANSWER$=INPUT$(LGTH)
10150 'Clear off line for future use
10160   LOCATE 25,1:PRINT SPC(79);
10170 'Restore the cursor to where it was
10180   LOCATE ONCE,WAS
10190   RETURN
```

More

"overscan" area. The Color statement allows you to set the color of the border. (For a white and blue foreground and background with a shocking red border, specify Color 7,1,4).

We're not done with the Screen command yet, though. Look at line 42 of Listing 2. You'll see four parameters for the text Screen (0) statement. The screen 0,1,0,0 in that line tells the PC that text (0) is to be selected, that color is enabled (1), that the "active page" of the display is number 0 and that the "visual page" which the user sees is also number 0.

The PC has the ability to hold up to eight text pages simultaneously, all in color, in its 16K color graphics adapter board. This allows the programmer to build a "help screen" by writing to the active page while the user is watching something else; it also gives the flexibility of switching to that page (visual page) instantly with a Screen 0,1,x,y statement.

I used this page-switching ability in line 860 of the listing to allow clean editing of the program input; I built a page-switching routine in subroutine 20000 which you can use in your own programs.

Locate finds the cursor in a row and column for text output. It is not as flexible as the TRS-80's Printat(xxx) command, because there are not as many separately-addressable locations on the IBM text screen as compared to the TRS-80's text-graphics system.

However, it's not as confusing to use, either. If you can put the cursor anywhere you'd like (and Locate also allows you to change the shape of the cursor, though Listing 2 does not use this form of that statement), you can save it with as much ease.

Subroutine 10000 shows the PC's CRSLIN and POS(0) functions, which store the row and column of the cursor's

position for repositioning later. These routines must be invoked when page-switching is going on to prevent getting hopelessly bogged when alternate pages are called.

I wrote this cursor save/replace routine, which I call Once Was, so that you can extract it intact for your own programs.

The Key statement in lines 47, 1770 and 20080, among others, has several incarnations, as the program shows. The statement refers to the ten function keys which border the left side of the PC's keyboard. (HP computer users, Apple III users and Model II TRS-80 users will be familiar with programmable function keys.)

Key Off turns off the visual display for the function keys' labels, which ordinarily are shown on a nonscrolling 25th line of the screen. Key On, obviously, restores this display, and there is also provision (not illustrated in the listing) to redefine the function keys in almost any manner desired.

On-Key Trap

The most interesting application of the Key statement, however, is in its On Key format, which occurs in subroutine 20000. What this statement does is to set a "trap"—after On Key (n) is executed, the program will jump to a specified subroutine whenever the user presses key letter n.

In listing 2, if the user chooses to edit his data input to the PERT-charting program, the function key gives him the option to change his mind and exit the change subroutine with no further effort than hitting function key number 1.

Note that I could have programmed the keyboard, disk and data statement input choice given the user in lines 140 to 180 with the function keys or accomplished just about any other task with them that could be accomplished with regular input. The reason I did not is that these On Key statements are formally software interrupts; they drive the program to a certain subroutine every time the function key is hit, unless a Key Off or Key Stop statement is executed.

The remainder of the code is a straightforward entry of the original Zimmerman/Conrad program in *Byte*, with several additional "cleanup" routines. For example, I've relocated most messages to the 25th (nonscrolling) line, and in some instances elected to omit requiring the user to press "enter" after his response to a question (see line 240, for example). And, I built an error-checking routine into the original code in subroutine 15000 to catch some of the more common errors that users might make (like not closing the disk drive door).

The important point is that, even with all these changes and the addition of color in a manner which makes the program a joy to use, the adaptation was straightforward and simple. There were no Call 768s to learn from the PC manual, and no idiosyncratic Print CHR$(27);"e";"q" codes to move the cursor around.

Enhanced Basic

IBM has enhanced its Advanced Basic well, but has not fallen prey in the translation to the kinds of implementation bugs that drive experienced users crazy and new ones to stick to canned software. You *can* use this machine.

When you run the program with a color monitor, note especially the powerful way in which tasks that lie on the critical path are highlighted by the program in red, and how useful the probability display becomes because of color highlighting and screen formatting.

These differences are often the ones between a program that is used and a program that languishes somewhere in the great magnetic void. Furthermore, printing the critical path items in red is a "red flag"—warning users that the items so highlighted must be closely managed.

If you want to try the program, but don't want to key it in, send me a disk and $10 and I'll copy it for you. Format your disk and write your name and address on it as well.□

Listing 2 continued.

```
15000 ' This subroutines does some error-checking, for instance, for the OPEN
15010 ' statement in line 390.  It requires an ONERROR GOTO 15000 statement
15020 ' for invocation, and is turned off with an ONERROR GOTO 0 statement.
15030 MISTEAK = 0: WHEREAT = 0
15040 MISTEAK = ERR: WHEREAT = ERL
15050 IF MISTEAK = 55 THEN CLOSE: RESUME
15060 IF MISTEAK = 53 THEN PRINT "CAN'T FIND THAT FILE - CATALOG: ":COLOR 3:
        PRINT "A: ":FILES "A:*.*":COLOR 9:PRINT "B: ":FILES "B:*.*":PRINT:PRINT
          "WAIT...":FOR I=1 TO 7000:NEXT I: RESUME 130
15070 IF MISTEAK =61 THEN PRINT "DISK IS FULL - PLEASE GET ANOTHER": FOR I=1
        TO 3000: NEXT I: RESUME 1730
15080 IF MISTEAK =64 THEN PRINT "THAT'S NOT A GOOD FILE NAME-USE "B:XXXXXXX.YYY"
        :FOR I= 1 TO 3000:NEXT I: RESUME 130
15090 IF MISTEAK = 68 THEN PRINT "THAT DISK DOESN'T EXIST...USE A: OR B: ":
        FOR I=1 TO 3000:NEXT I:RESUME 130
15100 IF MISTEAK =70 THEN PRINT "THE DISK IS WRITE-PROTECTED - CAN'T USE IT":
        FOR I=1 TO 3000:NEXT I: RESUME 130
15110 IF MISTEAK = 71 THEN PRINT "CLOSE THE DISK DOOR": FOR I=1 TO 3000:NEXT I:
        RESUME 130
15120 IF MISTEAK =72 THEN PRINT "I THINK THE DISK IS BAD: TRIES=TRIES+1:
        IF TRIES<3 THEN RESUME WHEREAT:ELSE PRINT "ENDING...CHECK DISK":
        FOR I=1 TO 3000:NEXT I: GOTO 1770
15130 IF MISTEAK =67 THEN PRINT "YOU HAVE TOO MANY FILES OPEN AT ONE TIME":
        FOR I=1 TO 3000: NEXT I: RESUME 130
15140 ON ERROR GOTO 0: RESUME
20000 ' This subroutines switches the active and visual pages in SCREEN 0
20010 ' mode to page 1, thus allowing the programmer to put "help" material,
20020 ' ancillary input and output, or other materials, on a "clean slate."
20030 ONCE=CSRLIN:WAS=POS(0)
20040 ABORT =0
20050 SCREEN 0,1,1,1     'color burst, apage=1, vpage =1
20060 CLS
20070 KEY(1) ON
20080 ON KEY(1) GOSUB 22000
20090 LOCATE 25,1:COLOR 4: PRINT "Hit <F1> key BEFORE entering to abort - I'll W
AIT before going on";
20100 LOCATE 5,35: COLOR 3: PRINT "CHANGE ROUTINE":COLOR 9
20110 COLOR 9,8,0
20120 FOR I=1 TO 5000:NEXT I
20130 RETURN
22000 CLS:SCREEN 0,1,0,0
22010 ABORT=1
22020 IF ABORT AND XCHECK THEN M%=M%-1:N%=N%-1:XCHECK=0
22030 LOCATE ONCE,WAS
22040 RETURN
22050 GOTO 20070
30000 GOTO 20070
30010 RETURN
```

By Robert W. Baker

Policing Your Word Processing

The Cardboard: Ideal Expansion Interface

Spellmaster

Spellmaster is an excellent machine-language program for proofreading word processor text files. The program checks each word within the text for an exact match in Spellmaster's dictionary. This typically takes less than two minutes for each text file.

After checking every word in your draft text, Spellmaster presents the reviewed text file for correction, editing and insertion of correctly spelled words into your own "user" dictionaries. The corrected text is then written back to disk, ready for formatting and output by your word processor.

Various versions of Spellmaster are available to work with Word Pro, Word Craft and Silicon Office word processors on PET 2001-32K, 4032, CBM 8032, 8096 and SuperPET systems with 2040, 4040, 8050 or 8250 disk drives. Any printer that will work with your word processor can be used with Spellmaster for printing a copy of the user dictionary.

A special ROM comes with Spellmaster and usually is installed in the UD12 socket of 4000/8000 series systems or the UD3 socket of 2001 series systems. This brings up the usual problems of having several programs that require a ROM in the same socket.

On an 8050 disk, Spellmaster is supplied with a 35,000-word dictionary. You can add another 7000 words in your user dictionary for a total of about 40,000 words. Legal and Medical dictionaries are available to supply another 4500 technical terms. On a 2040/4040 disk, however, you are severely limited in the number of words you can insert in the user dictionary.

Spellmaster is menu-driven, with full prompting for all user input. A 26-page, well-written manual guides the user through the various functions, explaining each feature in detail. A typical user should be able to learn the program in about 30 minutes.

Keep in mind that Spellmaster was not designed to identify proper sentence construction or mistyped words that happen to represent the correct spelling of another word. It simply checks each word of your draft text against those found in the internal dictionaries, without regard to the context in which the word is used.

Spellmaster does, however, automatically skip over internal word processor commands and numbers found within the text. It can be fooled at times if it encounters things like hexadecimal numbers or number ranges with a separating dash. Fortunately, these can be easily skipped when reviewing the suspected misspellings.

Checking and Correcting

Spellmaster can be used to check individual files or to automatically scan linked files. When correcting single files, the updated version can be saved in a new file or it can replace the original version with the same name. Linked files are always replaced by updated versions under the same filenames to preserve file linking.

During Spellmaster's edit phase, each word that was not found in the dictionary is presented in reverse video. A misspelled suspect word can be corrected simply by typing over the misspelled portion of the word. The cursor left, cursor right, insert and delete keys can all be used as needed. When corrected, simply press the return key to proceed to the next suspect word in the text.

Correctly spelled words, like proper names or technical terms not found in the dictionary, can be skipped over by hitting the return key. For convenience, you can skip forward a full screen at a time as well. If desired, you can permanently include a correctly spelled word in your user dictionary by hitting the up-arrow key.

If you accidentally insert a misspelled word in the user dictionary, a function is provided for deleting the word.

The delete option can also be used to kill seldomly used words and allow the insertion of high-priority words when the dictionary is nearly full. This is extremely useful on the limited 2040/4040 disk versions.

Spellmaster also provides a Fast Track dictionary option that uses only the first three modules of the Spellmaster dictionary plus your user dictionary modules. This offers a compromise between processing speed and proofreading accuracy. It's just the thing for that next rush project.

If you're a serious word processor user, you shouldn't be without something like Spellmaster. Written in assembly language, it's reasonably quick and the dictionaries can be tailored to suit your needs.

Standard Spellmaster packages sell for $199 while the Legal and Medical dictionaries are $75. For more information, write Spellmaster Systems Software, 6219 13th Avenue S., Gulfport, FL 33707.

VIC DIR Update

The original collection of programs provided with the VIC-1540 disk were not well done. Several were edits to older PET and CBM utilities that did not take into account the smaller screen size of the VIC. Commodore has promised a new demo disk with upgraded programs and possibly a few new utilities.

While we're waiting for the demo disk, here's a quick fix you can add to the DIR program to get nicer directory displays. The original version of the program allows the entries to wrap display lines, making them rather difficult to read.

With 22 characters per line, there's just enough room for a three-digit file size, 16-character filename and three-character file type. By using the color capabilities of the VIC and a little programming

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care, everything will fit without additional spacing.

Listing 1 shows lines 10 to 1010 of the DIR program as it was originally written; this is the part that displays the disk directory. Listing 2 shows my updated version—a few simple changes were made to avoid line wrapping.

Before going any further, please note that these listings were printed on a PET, so some of the graphics characters that appear for color controls may not be the same as on the VIC-20 display.

The changes include the adding of line 15 to clear the screen prior to starting a new directory. It also clears a flag (F) that will be used later. In line 50, an equate was added to define S$ as a string of 18 spaces.

The first character of the Print statement in line 80 is the color code for the file size, which I changed to yellow. In the same line, I also added the S$ string to STR$(C) and a length of 3 in the MID$ function. This ensures that the file size is three characters long and justified left.

Line 105 was added to clear C$ to a null string before building the disk or filename. The PRINT B$ in line 110 was then changed to C$=C$+B$ and the TAB(18) was changed to LEFT$(C$+S$,16) in line 130. These changes ensure that the disk or filename is always 16 characters long when displayed.

Line 125 was added to print the disk name in yellow, since F will be 0 only for the first line of the directory display. All filenames will be printed in black as set at the end of printing the file size in line 80. (I added a blue color control at the start of the Block Free message in line 1000 and an extra Print in line 1005 for spacing.)

Don't forget to add the semicolon at the end of the Print statement in line 150, or your display will be double-spaced. Since we're now printing exactly 22 characters per line for every line, the VIC will automatically start a new line when you print to the 22nd position of the line.

Cardboard

Recently I received a sample expansion interface for the VIC-20 from Cardco, Inc. (3135 Bayberry, Wichita, KS 67226). The Cardboard is a six-slot, fuse-protected expansion board with a system reset button. Multiple units can be daisy chained if you need more than six slots, as long as you watch the power load on the VIC.

The manual recommends not using more than two Cardboards, even though four have been used at once. But before talking more about the expander, there are a few things we should review about the VIC's memory layout.

There are seven blocks or areas of memory that are not used by the internal workings of your VIC-20. The address decoding for these blocks is made available to external hardware via the memory expansion port. RAM1, RAM2 and RAM3 are each 1K in size and are usually treated

```
READY.

10 OPEN1,8,0,"$0"
20 GET#1,A$,B$
30 GET#1,A$,B$
40 GET#1,A$,B$
50 C=0
60 IF A$<>"" THEN C=ASC(A$)
70 IF B$<>"" THEN C=C+ASC(B$)*256
80 PRINT"■■"MID$(STR$(C),2);TAB(3);"■■";
90 GET#1,B$:IF ST<>0 THEN 1000
100 IF B$<>CHR$(34) THEN 90
110 GET#1,B$:IF B$<>CHR$(34)THEN PRINTB$;:GOTO110
120 GET#1,B$:IF B$=CHR$(32) THEN 120
130 PRINT TAB(18);:C$=""
140 C$=C$+B$:GET#1,B$:IF B$<>""  THEN 140
150 PRINT"■■"LEFT$(C$,3)
160 GET T$:IF T$<>"" THEN GOSUB 2000
170 IF ST=0 THEN 30
1000 PRINT" BLOCKS FREE■■"
1010 CLOSE1:GOTO 10000
```

Listing 1. Original DIR program.

```
10 OPEN1,8,0,"$0"
15 PRINT"■";:F=0
20 GET#1,A$,B$
30 GET#1,A$,B$
40 GET#1,A$,B$
50 C=0:S$="                  "
60 IF A$<>"" THEN C=ASC(A$)
70 IF B$<>"" THEN C=C+ASC(B$)*256
80 PRINT"■■"MID$(STR$(C)+S$,2,3);"■■";
90 GET#1,B$:IF ST<>0 THEN 1000
100 IF B$<>CHR$(34) THEN 90
105 C$=""
110 GET#1,B$:IF B$<>CHR$(34)THEN C$=C$+B$:GOTO110
120 GET#1,B$:IF B$=CHR$(32) THEN 120
125 IF F=0 THEN PRINT"■";:F=1
130 PRINT LEFT$(C$+S$,16);:C$=""
140 C$=C$+B$:GET#1,B$:IF B$<>""  THEN 140
150 PRINT"■■"LEFT$(C$,3);
160 GET T$:IF T$<>"" THEN GOSUB 2000
170 IF ST=0 THEN 30
1000 PRINT"■■ BLOCKS FREE■■"
1005 PRINT
1010 CLOSE1:GOTO 10000
```

Listing 2. Updated version of DIR.

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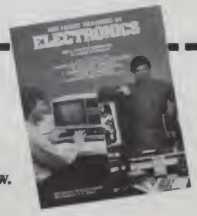

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as one unit. They're located sequentially below the internal 5K of RAM included in the standard VIC-20.

The remaining blocks are each 8K in length and are located as follows:

- BLK1 $2000–$3FFF
- BLK2 $4000–$5FFF
- BLK3 $6000–$7FFF
- BLK5 $A000–$BFFF

What happened to BLK4? Well, that's where the character generator ROMs, VIC registers, I/O and other miscellaneous internal workings are located.

BLK5 cannot be used for Basic programs since it is separated from the rest of RAM. It does, however, make an ideal place to locate machine-language programs since you don't have to worry about Basic touching anything in that area. In fact, this is where many of the game cartridges are located.

Now don't forget about the case of the moving screen memory. You may have been warned by some tape-based software suppliers that their programs will run only on an unexpanded VIC-20. The reason is that when you put 8K RAM in the VIC's BLK1 location, the screen RAM is moved to a new position (see Fig. 1).

The Cardboard has a switch that can disable the VIC's access to RAM BLK1 and make it easier to handle the moving screen problem. Thus you can quickly enable or disable all expansion RAM with this single switch without plugging and unplugging cartridges.

	Normal	With 8K or more
Screen Memory	7680–8185 $1E00–1FF9	1024–1530 $1000–11F9
Color Memory	38400–38905 $9600–97F9	37888–38393 $9400–95F9
Start of Basic	4096 or 1024 (3K) $1000 $0400	4608 $1200

Fig. 1. The cause of "moving screen memory"—when you put 8K RAM in the VIC-20's BLK1 location, the screen RAM is moved to a new location.

One at a Time

Since most ROM-based cartridges are designed to work in BLK5, you can normally have only one plugged in at a time. The Cardboard makes this a little easier by providing a separate BLK5 address select switch for each port.

Now you can plug in all your ROM-based cartridges and select which one you want by enabling the BLK5 line to that port. Remember that you can have only one of these switches on at any particular time.

Several cartridges, like the Programmer's Aid, use BLK3 and limit you to using two 8K cartridges or one 16K RAM cartridge. The Cardboard provides another set of six switches for enabling/disabling the BLK3 select line to make it a little easier to manage.

The Cardboard, which lists at $139.95, is nicely-made and well-documented. My only reservations concern the size of the address select switches. They actually consist of two sets of DIP switches and can be hard to manage due to their small size. On the other hand, the system reset switch is a reasonable size and the protection fuse is a nice feature.

Similar expansion interfaces are available from a variety of sources. They typically sell for $50 to $120, depending on the number of expansion slots provided. Most expansion units, including the Cardboard, do not provide any type of housing. All you get is a bare printed circuit board, so be careful where you put it and how you are going to use it.

By the way, there *is* an advantage (besides being able to plug in multiple cartridges) to using an expansion interface. It saves wear and tear on the expansion port connector in the VIC-20 itself.

With rough handling or heavy use, the normal printed circuit board connector will not last forever. If I had to replace a connector, I'd much rather have to do it on the expansion board instead of opening up the VIC-20 for repairs.

Misc

In October, Commodore introduced more than two dozen software programs for the Commodore 64. The new software includes two languages (in addition to the internal Basic), two word processing systems, an electronic spreadsheet, a mailing list, financial analysis, graphics plotting and music programs.

Included is the Easy Software series, which features EasyCalc, EasyPlot, EasyFinance (formerly EasyTools), EasySchedule, EasyFile, EasyScript, EasyQuiz and EasyLesson. This series is designed for business professionals and educators who want to benefit from having a computer without having to learn how to program.

EasyScript is a powerful word processor that offers 40- to 240-column text widths, software printer interfacing for letter quality and dot matrix printers, search and replace, text movements, tabs, function keys for frequently-used options, total cursor movement within a page and between pages and many other features formerly available only on more expensive word processing systems. A lower-priced word processor, The Word Machine, will also be available.

EasySchedule is an effective tool for planning time and resources and for keeping appointment logs. EasyFile is a full-fledged database for "electronic filing."

EasyQuiz and EasyLesson are classroom aids that help teachers design and administer tests and quizzes. Educators also will use Logo and Pilot, two computer languages used extensively in classrooms, as well as Pascal.

Commodore is engaged in an enormous international effort to collect thousands of public domain software programs to work on the Commodore 64, PET, CBM and SuperPET computer. The first 656 programs were introduced at a press conference in New York in October. The software will be made available for duplication through Commodore dealers and education resource centers.

The PET Emulator program will allow most existing PET software to be converted to or executed on the Commodore 64. To help programmers take advantage of the Commodore 64's sprite animation and music synthesis capabilities, Commodore will introduce a variety of programming aids, including an assembly-language development system, a sprite, sound and programmable character editor and a DOS wedge.

Commodore also will provide a Basic tutorial series for nonprogrammers who are interested in learning Basic on their Commodore 64.

The 64 will accept Commodore's new Max series of entertainment programs, which includes popular Bally Midway arcade games like Gorf, Omega Race, Kickman and Wizard of Wor. Other programs in the series include education/entertainment combinations such as The Visible Solar System and the Max Musicmaker. Max Cartridges will work with both the Commodore 64 and Commodore's low-priced Max Machine home computer, which is scheduled for introduction early this year.

* * *

CGRS Microtech (PO Box 102, Langhorne, PA 19047) is offering a color video interface, Color Chart, for the PET/CBM. The 2½ × 5 board plugs into a 2532 ROM socket; two control wires must be clipped to the system's read/write signals. The ROM socket is then converted into a 4K video RAM.

Based on the 6847 video controller, the interface reads information that the computer writes to video RAM and translates it into standard RS170-type composite video output. This can directly drive most color video monitors or can be used with an rf modulator and color TV set.

Color Chart, which carries a $139.95 list price, operates in eight different modes. They range from an alphanumeric 32 × 16 display with built-in character generator to a high resolution graphics mode with 128 × 192 pixels. Up to eight different colors are available.

Color Chart can be used to present independent color graphics displays on the PET/CBM while the main screen displays corresponding text.

The same company is also offering a new word processor for PET/CBM systems. Copy-Writer appears to offer the standard features along with double column printing, auto page break by paragraph, full printer graphics control, file chaining, ability to send hex control codes for printer controls and unformatted listings with internal control codes.

Selling price is set at $185 plus $5 shipping and handling.

* * *

If you're about to buy a VIC-Modem, check your phone first! You must have a phone with modular plugs on the wire between the handset and the base of the phone to be able to connect the modem. Also, the dialing mechanism must be in the base of the phone, not in the handset. The modem will not work with the popular Trimline phones.

A nonmodular telephone adaptor is available, however, that lets you plug the VIC-Modem directly into a modular wall outlet. Cost of the adaptor is $15.95. If you don't have a modular wall outlet, your local Radio Shack store carries various connectors and adaptors that should be able to help.

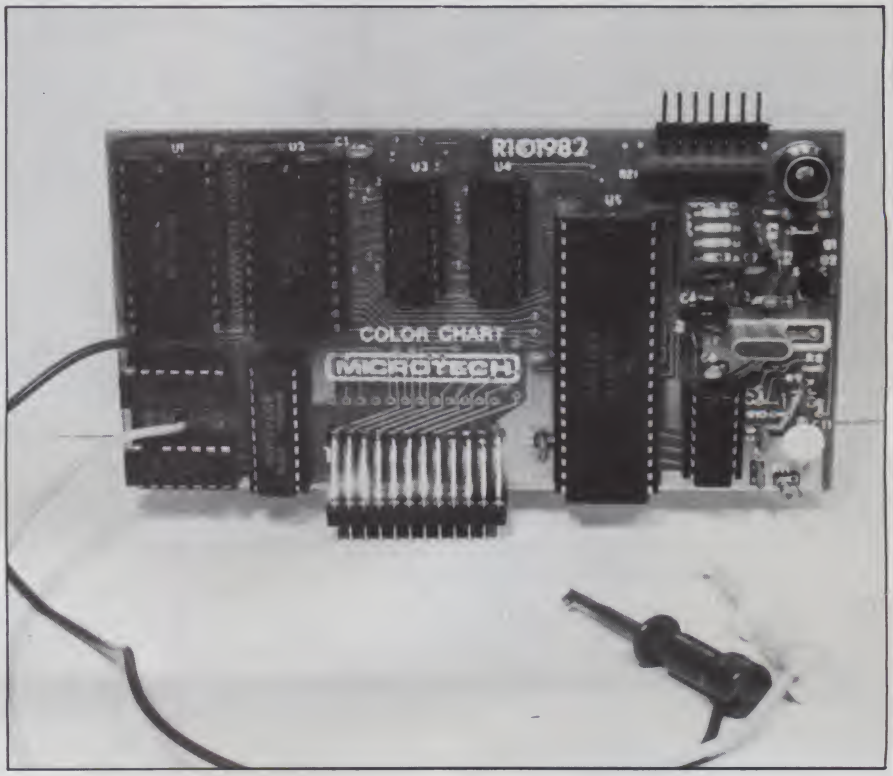
By the way, the Commodore information network is now one of the top 12 most used services on Compuserve. There is a full-time editor employed by Commodore, and there are now over 1000 pages of information available.

The network hotline is averaging over 500 calls a week as opposed to about 1000 calls per week on Commodore's regular telephone hotline. Commodore sold more VIC-Modems in the first three months of sales than the total number of subscribers Compuserve had in the summer of 1982.

* * *

Well, in case you haven't noticed, this is the start of my fourth year as author of the PET-pourri column. It's been rather hectic at times, but I've had fun and learned an awful lot over the years. I hope you have too. With all the new machines and an avalanche of new software, there should be plenty to keep us busy over the coming months.□

Address correspondence to Robert W. Baker, 15 Windsor Drive, Atco, NJ 08004.



The Microtech Color Chart is a color video interface for the PET/CBM.

LETTERS TO THE EDITOR

Who Knows?

First I must express my appreciation for your fine publication which I have enjoyed for several years (I keep calling it *Kilobaud*). Please continue to maintain the quality and character of the articles; however, this communication is more than a letter of thanks!

I recall reading either an article, advertisement or response to a reader inquiry about a method of converting files that have been stored on IBM Magcard to standard CP/M format on 5¼-inch floppy disks. I have paged through my stack of *Microcomputings*, but was not successful in locating this information. Does anyone have information on this method?

Paul A. Loeffler
1520 18th St.
Huntsville, TX

A Warning to Apple Owners

Ken Knecht's article, "Numeric Storage—As Easy as 1,2,3," in the July issue of *Microcomputing* (p. 58), should have contained some warnings for Apple II users. The process he describes will work only for internal storage on the Apple II. If strings generated in that manner are written to the disk, several problems occur.

Some of the characters, such as ASCII 4, are used to send instructions to the disk controller. In addition, if these few characters are avoided, the strings will go out and come back, but unfortunately not unchanged.

Apple II DOS reduces all characters to under ASCII 128. Thus, if you write ASCII 130, the character read from the disk is ASCII 2. The Apple II is the only system that I have found with this problem. The approach does seem to work fine on the Atari, Osborne, TRS-80 and TI systems.

Frank Matthews
Houston, TX

Reply

Thank you for bringing this information to my attention. Since I do not have an Apple computer or program Apples, I was unaware of this problem. I'm sure the readers who have Apples will be interested in hearing about it.

All the other computers on which I tried the technique had no problem. Of course, it is impossible to try a technique on all the available systems. If it works on the ones I do have access to, I just have to assume it will work on most of them.

It's too bad Apple users can't take advantage of this technique. I find it very useful for storing many values in files, dates, small quantities and many other things.

Ken Knecht
Yuma, AZ

Synchronous or Asynchronous: What a Difference an A Makes

In the October issue of *Microcomputing*, the "IBM Update" article (p. 98) by Frank Pozar is misleading in regards to the IBM Personal Computer's ability to emulate an IBM 3270 remote terminal.

The article states that a $50 Asynchronous Communications package will allow the PC to attach to both a 370/158 and a Series One as a 3270 remote terminal.

The 3270 terminals are all synchronous devices. The only way that a PC would be able to emulate a 3270 remote terminal to a 370/158 would be to attach the PC to the Series One asynchronously and attach the Series One to the 370/158 with a synchronous connection. You must have both a $50 Asynchronous Communications package and an IBM Series One to emulate a 3270 as described in the article.

Jack Leftwich
Cincinnati, OH

Reply

Sorry about that. Mr. Leftwich definitely caught me flat-footed. There's a vast difference between synchronous and asynchronous communications—the price difference between what IBM charges for each of these packages certainly demonstrates that.

It's a tribute to the PC that it can be connected to IBM's big machines (and sidestep the Series 1 connection) by simply plugging in an adapter board.

IBM's asynchronous communications package, for example, costs $60 (version 2.0) while their 3270 emulation costs $700. IBM's package allows a PC to emulate either a Systems Network Architecture (SNA) 3270 terminal or a Remote Job Entry (RJE) terminal. I might add that the adapter card is an extra $300 and this SDLC (Synchronous Data Link Control) allows the PC to communicate synchronously through an optional modem and a $75 cable to connect to the modem.

*In October of 1981, when I wrote the article, two trade journals (*Electronics and Electronics News*) mentioned that IBM was coming out with the software to emulate the 3270 terminal and I thought this was the package. The synchronous package is scheduled for January 1983, which is about a year after most people expected it.*

I might add that at least one company produces a similar package:

Automated Business Machines, Inc.
29352 Avocet Lane,
South Laguna, CA 92677

This package is a 3270/ BSC/ SNA/ SDLC emulator and interfaces with 3704/3705 communications adapters on the big IBM machines. This version emulates 3276 control stations supporting 3278 displays and 3287 printers just like IBM's. Their price also includes an adapter board and ranges from $1295 (for a 3276 terminal and 3287 printer emulation) to $1995 for their deluxe model with interactive protocol switch (your guess is as good as mine). These prices are as of September.

Frank Pozar
Spokane, WA

Go Forth

I noticed in the August ("Pascal and Basic Square Off," p. 22) and September ("Still More on Speed," p. 20) Letters to the Editor that there is considerable interest in benchmark testing, particularly with respect to the Shell Sort and IBM PC. As an IBM PC owner, I must agree that the interpreted Basic is disappointingly slow.

My solution to this problem was to go Forth. I have included a listing of a practically verbatim translation of the Basic Shell Sort Program into MMS Forth (Listing 1). This implementation of Forth uses the same ROM subroutines for floating-point arithmetic that are used by Basic. My program took an average of 33 seconds to sort 500 numbers.

I have a suggestion for future benchmark testing—include a program for matrix inversion because:

- It is an important and widely used subroutine fundamental to engineering and science.
- It contains a good balance of data transfers and floating-point arithmetic.
- No other magazine that I know of uses it for benchmark tests.

I have a Forth program that inverts a 10th-order matrix in two seconds for seven significant digits and five seconds for 16 digits. I would really like to see how Forth compares with other languages like APL, C, Fortran and Pascal. Forth is

```
158 LIST
 0 ( Shell Sort          ) : TASK ;
 1        VARIABLE NN VARIABLE D
 2        1000 2ARRAY A 2VARIABLE K
 3 : RNDA % 0 K 2! NN @ 0 DO % 1 K 2@ F+ K 2! K 2@ % 1 RND F* I
 4        A 2! LOOP ; ( Fill Array with Numbers )
 5 : A.   NN @ 0 DO CR I A 2@ F. LOOP ; ( Display Array, A )
 6 : SORT NN @ D ! BEGIN D @ 1+ 2 / D ! BEGIN 1
 7        NN @ D @ - 0 DO I A 2@ I D @ + A 2@ FCOMP 1- NOT
 8        IF I A 2@ I D @ + A 2@ I A 2! I D @ + A 2! DROP 0
 9        THEN LOOP UNTIL D @ 1 <= UNTIL ;
10 : TEST CR ." How Many Numbers " #IN NN ! CR RNDA
11        0 0 0 SET-TIME SORT GET-TIME ." Time = " . . . . ;
12
13
14
15  ok


TEST
How Many Numbers  ? 500
Time = 0 0 34 10  ok
TEST
How Many Numbers  ? 500
Time = 0 0 33 9  ok
TEST
How Many Numbers  ? 500
Time = 0 0 31 11  ok
```

Listing 1. Translation of the Basic Shell Sort program into MMS Forth.

not a popular floating-point language, but I see no reason why it shouldn't be.

Steven A. Ruzinsky
Cicero, IL

Author, Author

As a new subscriber to your magazine, I was stumbling along trying to relate my limited experience with my Apple computer to your other readers' great skill in CP/M and other systems and languages. I paused for a moment to be amused by yet another battle of benchmark tests between computers—this time on RND functions!

I find this amusing because most of the stuff I do adds delay loops to slow things down so I can cope with the miracle of the computer.

Then I realized what was bothering me as I read the November issue of your magazine . . . pages 84–85. This is where the Game Digest is put together. It does a good job of summary and provides a good cross-section of available material. But—I noticed that in the battle of ratings, financial reports, sales figures, comments on ease of use and pontifications on piracy, the author is not listed. The name of the man, woman (or team) whose experience, skill, ingenuity and labor go into the creation of a program is never mentioned!

Is there something not wrong with the other side of computing if the author or programmer—the creator—is so completely ignored?

Paul Raymer
Las Vegas, NE

LNW-80: Complex Construction

While I agree with William G. Eisinger (The Enhanced 80—October 1982, p. 58) that the LNW-80 is an outstanding computer, I think one point must be stressed most vigorously—building an LNW-80 is not for the beginner or even the intermediate kit builder.

Unless you are familiar with digital logic, have experience building and troubleshooting computer circuits, and have access to good quality test equipment, you probably should not build an LNW-80.

As editor of an LNW user-group newsletter, I have heard dozens of stories from inexperienced kit builders who have gotten in over their heads and now have $700–$900 tied up in a hopeless mess. If they are lucky and haven't made too big a mess of it, they may be able to coax LNW or someone else to repair it for about $200–$400.

While some of our user-group members feel that LNW should state in their advertisements that building an LNW-80 is not for the beginner, I don't quite agree. It should be left up to the individual to decide if his abilities meet the requirements of the project. In other words, let the buyer beware. So all you high school students with a couple of electronics classes under your belt, this is not a project for you. That also goes for most weekend kit builders.

If any of *Microcomputing*'s readers are interested in joining our LNW-80 user-group and receiving our bi-monthly newsletter, they can send $12 to The LNW User Newsletter, 4345 Manchester Rd., Grand Island, NB 68801. We have several hundred members in the U.S. and in several foreign countries. Our newsletter contains software reviews, hires and color programs, hardware hints and kinks, and LNW-80 construction information. A limited number of back issues are also available.

Jay Hokanson
Grand Island, NB

Reply

Mr. Hokanson certainly raises a valid point; however, the purpose of my article was to review the LNW-80's features as a computer and not to assess the ability of LNW Research Corp. to market a Heathkit-style kit.

Even so, I will again point out that the LNW-80 is not a project for beginners. The circuitry is complex and the documentation is among the worst I have ever seen. There are errors in the schematics, conflicts in parts requirements lists, and the errata sheets are extremely confusing.

As a minimum, the prospective builder should have access to, and know how to use, a digital multimeter and an oscilloscope capable of observing 10 Mhz signals. A frequency counter can also be helpful.

In fairness to LNW Research Corp., I feel that they are providing a valuable service to those hobbyists wanting a superior TRS-80 type of system for half the cost.

There are still a lot of us "hardware hackers" out here who view the challenge and frustration of assembling a project such as the LNW-80 as all part of the fun.

William G. Eisinger
Boise, ID

Micro Software Digest

Compiled by Swain Pratt

Micro Software Digest presents a collection of capsulized software reviews from various computer-related publications. Micro Software Digest is presented in an index-card format; so read on and clip and keep your favorites.

CP/M SYSTEM

SuperSoft Fortran

System Requirements: CP/M-compatible system, CP/M, one disk drive
Manufacturer: SuperSoft, PO Box 1628, Champaign, IL 61820
Price: $275
Comments: According to the review, SuperSoft is the most complete version of Fortran for microcomputers. "One of the nicest aspects of the compiler," says the review, "is that it supports the complex data type, which makes it particularly useful to engineers or scientists whose applications typically demand this kind of arithmetic."

The review has reservations about the documentation, but concludes "This is an excellent Fortran compiler. It has the features that serious users need, and it should be high on your list of alternatives."
Reader Service number 427

(Reviewed in InfoWorld, *October 18, 1982)*

OSBORNE

Computer Chef

System Requirements: Osborne 1, Heath/Zenith or standard CP/M systems; CP/M 1.4 or later or HDOS; 48K RAM; Dual-floppy or hard-disk drives; 80X24 cursor-addressable CRT; 80-column printer
Manufacturer: The Software Toolworks, 14478 Glorietta Drive, Sherman Oaks, CA 91423
Price: $29.95
Comments: "Computer Chef," says the review, "makes it easy for you to manage your recipes and includes some capabilities that really let you take advantage of having them on a computer."

"It comes with over 70 recipes," continues the review, "but if you want to use it to keep track of your own recipes, you can use any text editor or word processor to input them."
Reader Service number 410

(Reviewed in InfoWorld, *October 11, 1982)*

Z-80 SYSTEM

Sort/B

System Requirements: 8080 or Z-80 system, CP/M, 56K RAM, one disk drive
Manufacturer: System/Z, PO Box 11, Richton Park, IL 60471
Price: $25
Comments: Sort/B is a sorting package you can use with Microsoft's Basic-80 interpreter, according to the review. "You call it as an assembly-language subroutine, and you can use it to sort memory arrays of any Basic-80 data type."

The program "works well, is easy to use and has a reasonable price," says the review. "The manual is not the best, but it tells you most of the things that you need to know."
Reader Service number 405

(Reviewed in InfoWorld, *October 11, 1982)*

Z-80 SYSTEM

Ada Compiler

System Requirements: 8080, 8085 or Z-80 microprocessor, CP/M, CP/M-86, or MS-DOS, 48K RAM
Manufacturer: Supersoft, PO Box 1628, Champaign, IL 61820
Price: $300 (CP/M version)
$350 (CP/M-86 or MS-DOS versions)
Comments: Ada is a standard, higher-order language being developed for the Department of Defense to meet its special needs and to improve software portability. Its appeal to industry and educational institutions will, according to the review, be widespread. Several companies are developing Ada compilers to government order, and the Ada Compiler from SuperSoft is an interim answer.

"With the Supersoft Ada Compiler," says the review, "you can learn the language and begin writing programs now that will be completely transportable to larger machines. Ada borrowed many features from Pascal, but it is a much larger and more powerful language and has features associated with other languages as well."
Reader Service number 403

(Reviewed in InfoWorld, *October 11, 1982)*

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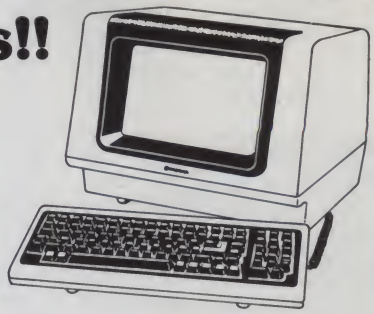

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APPLE

Queen of Phobos

System Requirements: Apple II with 48K, ROM Applesoft with one disk drive
Manufacturer: Phoenix Software, 64 Lake Zurich Drive, Lake Zurich, IL 60047
Price: $34.95
Comments: This is an adventure game with unusual graphics—line drawings, not color. "The Queen of Phobos," says the review, "is the hulk of a huge passenger transport abandoned in space. It's said that a very valuable enchanted mask was left on the wreck and your people have sent you after it. Unfortunately, other people have similar ideas; you are not alone on the ship."

The review describes the puzzles encountered as logical but not easy. "Queen of Phobos offers several evenings of pleasurable, if frustrating, diversion for the adventurer," concludes the review.
Reader Service number 420

(Reviewed in Softalk, *September, 1982)*

APPLE

Quadrant 6112

System Requirements: Apple II with 48K, ROM Applesoft with one disk drive
Manufacturer: Sensible Software, 6619 Perham Drive, West Bloomfield, MI 48033
Price: $34.95
Comments: Quadrant 6112 is a game in which the player must defend his quadrant against the usual stream of aliens. "Quadrant 6112," says the review, "does, in fact, add a few twists to the traditional alien shoot-'em-up, and therein lies its saving grace. You must think as well as react in this game."

The game "keeps you on your toes," the review continues. "The speed and excitement of the game more than make up for the lack of graphic sophistication. Anyway, most of the time you're too busy to notice."
Reader Service number 418

(Reviewed in Softalk, *September, 1982)*

APPLE

Wine Cellar

System Requirements: Apple II with 64K, ROM Applesoft with one disk drive and language card
Manufacturer: WE Software, 800 Greenwich Drive, Chico, CA 95926
Price: $500
Comments: "This simple, easy-to-use database is for organizing the vintages and varietals of your wine collection," says the review. Just the thing for the man who has everything!

According to the review, "Information can be entered for each particular wine under winery, varietal, vintage, region, number of bottles, month, year, price of purchase and current value. . . Wine Cellar is a custom-tailored inventory program that can be used by wine shops and restaurants and can certainly be of immense value to individual wine connoisseurs."
Reader Service number 425

(Reviewed in Softalk, *September, 1982)*

APPLE

Weather Fronts

System Requirements: Apple II Plus or Apple II with Applesoft, DOS 3.3, 48K RAM, one disk drive
Manufacturer: Teach Yourself by Computer Software, 40 Stuyvesant Manor, Geneseo, NY 14454
Price: $24.95
Comments: Weather Fronts has the limited objective of teaching a few facts about the general characteristics and causes of fronts. "These facts," according to the review, "are all interesting and important to know in a high-school earth science course, but many more facts about weather fronts are normally taught."

"The program does a good job of teaching. . . but a good textbook and a good teacher would teach a student much more about weather fronts," says the review.
Reader Service number 404

(Reviewed in InfoWorld, *September 27, 1982)*

APPLE

Marauder

System Requirements: Apple II with 48K, ROM Applesoft with one disk drive
Manufacturer: Sierra On-Line, 36575 Mudge Ranch Road, Coarsegold, CA 93614
Price: $34.95
Comments: "Some things never change," says the review. "And space Shoot-'em-ups like Marauder continue to have that never-changing appeal. There are two scenarios to Marauder. The first pits you against a city defending itself." In the second, you try to penetrate a maze to destroy the city's power center. The two scenarios can be played separately or sequentially on either keyboard or joystick.
Reader Service number 414

(Reviewed in Softalk, *September, 1982)*

APPLE

Real Estate Analyzer II

System Requirements: Apple II with 48K, ROM Applesoft with one disk drive
Manufacturer: Howard Software, 8008 Girard Ave, Suite 310, La Jolla, CA 92037
Price: $195
Comments: The review describes Real Estate Analyzer II as "designed to perform detailed cash flow and return-on-investment analysis, with an eye toward making the maximum profit possible consistent with the minimum exposure to loss. . . (and) to point out those investments that will use the least cash possible while maximizing the use of appropriate legal and tax strategies."

"This is a professionally written piece of software," the review concludes. "But anyone interested in buying investment property today would benefit from a package such as this one."
Reader Service number 417

(Reviewed in Softalk, *September, 1982)*

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APPLE

GraphPower

System Requirements: 64K Apple II, 128K Apple III or 128K IBM PC and two disk drives
Manufacturer: Ferox Microsystems, Inc., 1701 N. Ft. Myer Drive, Suite 611, Arlington, VA 22209
Price: $295
Comments: GraphPower is a business-graphics package that "uses simple, self-explanatory menus and prompts that allow users to create multicolor overhead transparencies and paper output with the HP 7470 two-pen plotter," states the review.

"GraphPower creates line, pie, bar, stacked bar, side-by-side bar, text and financial report charts," continues the review. "Graphs can be labeled with title lines, axes labels and dividers and annotated with legends and blocks of text with pointers."
Reader Service number 424

(Reviewed in Personal Computing, *November, 1982)*

APPLE

VisiSchedule

System Requirements: Apple II or II Plus, 48K, two disk drives
Manufacturer: VisiCorp, 2895 Zanker Road, San Jose, CA 95134
Price: $300
Comments: The VisiSchedule program, according to the review, "encompasses PERT (Program Evaluation and Review Technique) and CPM (Critical Path Method), providing management with a very powerful resource allocation, scheduling and control tool."

The VisiSchedule program is written in UCSD Pascal, but "all is explained clearly and carefully and will be of little bother to the computer novice," says the review, since the documentation is excellent.

"It is encouraging," concludes the review, "to find a manual and a program that mesh so well to make a practical and powerful scheduling tool widely available to owners of personal computers."
Reader Service number 402

(Reviewed in Small Business Computers, *July/August, 1982)*

IBM PC

QADBO1

System Requirements: IBM PC, PC-DOS, 64K RAM, one or two disk drives
Manufacturer: Software by C. Abaci, Inc., PO Box 5715, Raleigh, NC 27650
Price: $68
Comments: "QADBO1 is an interactive, adaptive, quadrature product that estimates the integral of a function over a user-supplied interval," says the review. In other words, "the program finds the area under a specific curve between two defined points."

"To use the program," the review continues, "you need to know a bit about programming in Basic, must understand integration of functions and have formulas ready for crunching." The review concludes that QADBO1 "does its job well and is intended for mathematicians and more advanced computer users."
Reader Service number 421

(Reviewed in InfoWorld, *November 1, 1982)*

IBM PC

SuperCalc

System Requirements: IBM Personal Computer, optional color display monitor
Manufacturer: Sorcim Corp., 405 Aldo, Santa Clara, CA 95050
Price: $295
Comments: "SuperCalc is an extremely well-designed software package," says the review, "which should prove to be a strong contender for leadership in electronic spreadsheets."

According to the review, the program's power and versatility are impressive, it is easy to use, and, "with a little study and imagination it can become an indispensible management tool."
Reader Service number 406

(Reviewed in Small Business Computers, *July/August, 1982)*

IBM PC

Full Screen Editor

System Requirements: IBM PC, PC-DOS, 64K RAM, one or two disk drives, printer
Manufacturer: Frank L. Schiele Software, 1375 Tobias Drive, Chula Vista, CA 92011
Price: $55
Comments: "Full Screen Editor . . . lets you create, alter and display source or text files, which is not a standard feature on the IBM Personal Computer," says the review. "It works like a word processor, but edits data files rather than files written in BASIC."

"Full Screen Editor lets you edit data files that cannot be accessed with the regular IBM PC editor. This editor is a useful and efficient program," concludes the review.
Reader Service number 407

(Reviewed in InfoWorld, *October 11, 1982)*

VIC-20

Four New Cartridges for VIC-20: Omega Race; Gorf; Sargon II Chess; Visible Solar System

Manufacturer: Commodore International, 487 Devon Park Drive, Wayne, PA 19087
Price: $39.95 each
Comments: In Omega Race, your command ship must evade and destroy three types of enemy ships and two kinds of mines. "The game is very fast-moving and difficult to master," says the review. Gorf puts you in a fighter under attack by the Gorfian Empire. You must kill or be killed through four attack waves. Sargon II Chess, according to the review, "probably has the best reputation of all the microcomputer chess programs . . . I would guess that this is the most sophisticated program available for the VIC." Visible Solar System, an educational program, is a simulation giving several views of the solar system and facts about the planets.

According to the review, "These cartridges turned out to be excellent examples of the full capabilities of the VIC . . . all were challenging and fun to use."
Reader Service number 409

(Reviewed in COMPUTE!, *October, 1982)*

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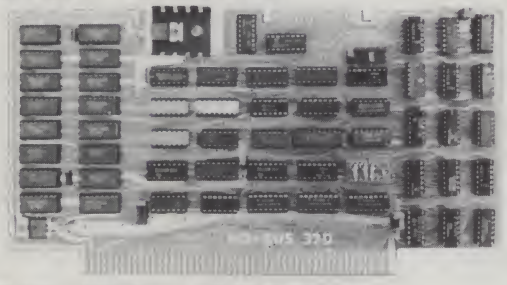

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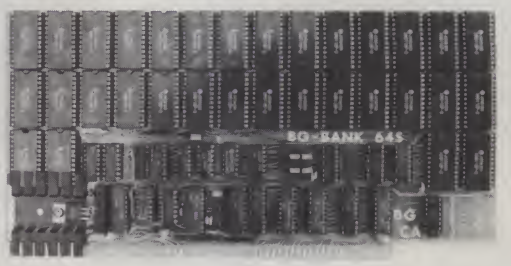

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Circle 26 on Reader Service card.

ATARI
Crossword Magic

System Requirements: Atari 800, 40K RAM, one disk drive, a graphics-capable printer
Manufacturer: L & S Computerware, 1589 Fraser Drive, Sunnyvale, CA 94087
Price: $49.95
Comments: "Crossword Magic allows you to create, save and print computer-assisted, English, non-symmetrical crossword puzzles in just a few minutes," according to the review. "The Atari version . . . is exceptionally well designed."

"Both the program and the operating instructions are simple to use," concludes the review. "For the educational value, this program is well worth the price. It's also lots of fun!"
Reader Service number 416

(Reviewed in InfoWorld, *October 18, 1982)*

ATARI
The Disk Workshop

System Requirements: Atari 400 or 800 computer with 32K and one disk drive
Manufacturer: Synergistic Software, 830 N. Riverside Drive, Suite 201, Renton, WA 98055
Price: $34.95
Comments: "The Disk Workshop . . . is actually seven separate utility programs," says the review, "designed to assist Atari programmers with programming functions."

"The program includes disk editing capabilities, fast copying of disks, a formatted disk directory which can be sent to a printer, use of machine-language character strings in Basic, a screen dump for the MX-80 Epson printer with Graftrax or Graftrax Plus, and the ability to transfer large files of data to disk or cassette," according to the review.
Reader Service number 423

(Reviewed in Personal Computing, *November, 1982)*

ATARI
Four New Games for the Atari: Canyon Climber; Pacific Coast Highway; Clowns and Balloons; Shooting Arcade

Manufacturer: Datasoft, Inc., 19159 Business Center Drive, Northridge, CA 91324
Price: $29.95 each (cassette or disk)
Comments: "All these games show off the graphics and animation capabilities of the Atari," says the review. "With the release of these games, Datasoft issued an implicit challenge to game producers to use the Atari's features to the utmost."

Shooting Arcade's moving targets require accurate aim. Pacific Coast Highway challenges you to cross a busy freeway safely, reaching a beach where you gather points by jumping from surfboard to surfboard. Canyon Climber asks you to scale the walls of Grand Canyon against the opposition of rocks, arrows and butting goats. Clowns and Balloons involves bouncing a clown in a trampoline and clearing the screen of ever-regenerating balloons.
Reader Service number 408

(Reviewed in COMPUTE!, *October, 1982)*

ATARI
Advanced Music System

System Requirements: Atari 400/800 with 32K RAM, Atari Basic language cartridge and Atari 810 or compatible disk drive
Manufacturer: The Atari Program Exchange, 155 Moffett Park Drive, B-1, Sunnyvale, CA 94086
Price: $29.95
Comments: "Advanced Music System is a music composing/editing/playing program," says the review. "Both the program and the documentation are of superior quality, and the price is reasonable."

It is helpful, the review asserts, to have some idea of how electronic music works, but "the program is great both for the composer, or for someone just learning about music."
Reader Service number 413

(Reviewed in Softside, *issue # 34)*

ATARI
Retirement Planning

System Requirements: Atari 400 or 800, 32K RAM, one disk drive and the Atari Basic cartridge
Manufacturer: Advanced Financial Planning, 20922 Paseo Olma, El Toro, CA 92630
Price: $29.95
Comments: Retirement Planning is designed to help develop a personal retirement plan. "The program takes into account the user's financial situation relative to inflation, investment returns and retirement income needs," says the review.

"The program calculates . . . the amount needed for a retirement fund that will keep income constant," continues the review, and "analyzes the plan to determine if changes must be made and offers suggestions as to what these changes should be."
Reader Service number 426

(Reviewed in Personal Computing, *November, 1982)*

ATARI
SAM, the Software Automatic Mouth

System Requirements: Atari 400 or 800, at least 32K RAM and one disk drive
Manufacturer: Don't Ask Computer Software, 2265 Westwood Blvd., #B-150, Los Angeles, CA 90064
Price: $59.95
Comments: SAM is a computer speech synthesis product which requires no special hardware, says the review, and "provides the highest-quality computerized speech currently available for Atari computers."

"SAM, when combined with the companion program, RECITER," continues the review, "will pronounce nearly 90% of the English language properly." Even without RECITER, according to the review, SAM will pronounce all words by using the phonetics system.
Reader Service number 412

(Reviewed in ANTIC, *October/November, 1982)*

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VIC-20

HES Writer

System Requirements: VIC-20 computer
Manufacturer: Human Engineered Software, 71 Park Lane, Brisbane, CA 94005
Price: $39.95
Comments: HES writer is a cartridge word-processing program. "It contains some features," says the review, "such as word wrapping, not found on more expensive Commodore word processors. It also has separate edit and entry modes, reminiscent of a line-oriented text editor."

The review praises the content and style of the manual, if not its format, and favored the cartridge "since it eliminated the long wait and load errors inherent in long tape programs."
Reader Service number 419

(Reviewed in InfoWorld, *November 1, 1982)*

VIC-20

Spiders of Mars

System Requirements: VIC-20
Manufacturer: United Microware Industries, 3503 Temple Ave., Pomona, CA 91768
Price: $59.95
Comments: In this cartridge game, you are a fly on the planet Mars, defending yourself by shooting spiders, hornets, bats and dragonflies that are after you.

"This game is reminiscent of the arcade version of *Defenders*," says the review, and "also uses color and sound quite effectively."
Reader Service number 401

(Reviewed in COMPUTE!, *November 1982)*

VIC-20

Satellites and Meteorites

System Requirements: VIC-20
Manufacturer: United Microware Industries, 3503 Temple Ave., Pomona, CA 91768
Price: $49.95
Comments: In this cartridge game, beginning without any preliminaries, "Your spaceship is being menaced by meteors, satellites. . . and black holes," reports the review. "You shoot and maneuver your ship with a choice of keyboard or joystick."

"The game has excellent graphics, but only fair to good sound effects," concludes the review. On the whole, the reviewer found the game difficult and excellent.
Reader Service number 411

(Reviewed in COMPUTE!, *November, 1982)*

IBM PC

Math Drills

System Requirements: IBM PC, PC-DOS, 64K RAM, one disk drive
Manufacturer: StarWare, 1701 K St., NW, Suite 800, Washington, DC 20006
Price: $25
Comments: "Math Drills lets students practice. . . both easy and difficult math problems involving addition, subtraction, multiplication and division," says the review. "It is a one-disk program that includes all the information necessary to run it."

The program "contains enough material to keep students busy for two to three hours, depending on their skill levels," continues the review. It is not a teaching device, but "seems to be more suitable for people who want to improve their arithmetic skills."
Reader Service number 422

(Reviewed in InfoWorld, *November 1, 1982)*

IBM PC

Screen Print Program

System Requirements: IBM PC, PC-DOS, 64K RAM, one or two disk drives, Epson MX-80 with Graftrax or MX-100 printer, monitor that can display graphics
Manufacturer: M.A.P. Systems, Inc., 1120 NASA Road One, Suite 444, Houston, TX 77058
Price: $44.95
Comments: "Screen Print Program is a one-disk utility program that lets you print any screen contents to a compatible Epson printer," says the review. "The program resides as part of PC-DOS and is written in Intel 8088 machine language."

This program, the review concludes, "is a useful utility that enhances the graphics capabilities of your computer. Anyone who uses graphics or double size letters and needs printed copies will find it useful."
Reader Service number 415

(Reviewed in InfoWorld, *October 18, 1982)*

ANTIC Publishing Company, 297 Missouri St., San Francisco, CA 94107; $15 annually, six issues.

COMPUTE!, published by Small System Services, Inc., PO Box 5406, Greensboro, NC 27403; $20 annually, 12 issues.

InfoWorld, published by Popular Computing, Inc., 375 Cochituate Road, Box 880, Framingham, MA 01701; $25 annually, 51 issues.

Personal Computing, published by Hayden Publishing Company, Inc., 50 Essex St., Rochelle Park, NJ 07662; $18 annually, 12 issues.

Small Business Computers, published by Creative Computing, 39 E. Hanover Ave., Morris Plains, NJ 07950; $12 annually, six issues.

Softalk, 11021 Magnolia Blvd., N. Hollywood, CA 91601; $24 annually, 12 issues.

Softside, 6 South St., Milford, NH 03055; $30 annually, 12 issues.

Table. Addresses and subscription prices of the magazines publishing the software reviews digested in this department.

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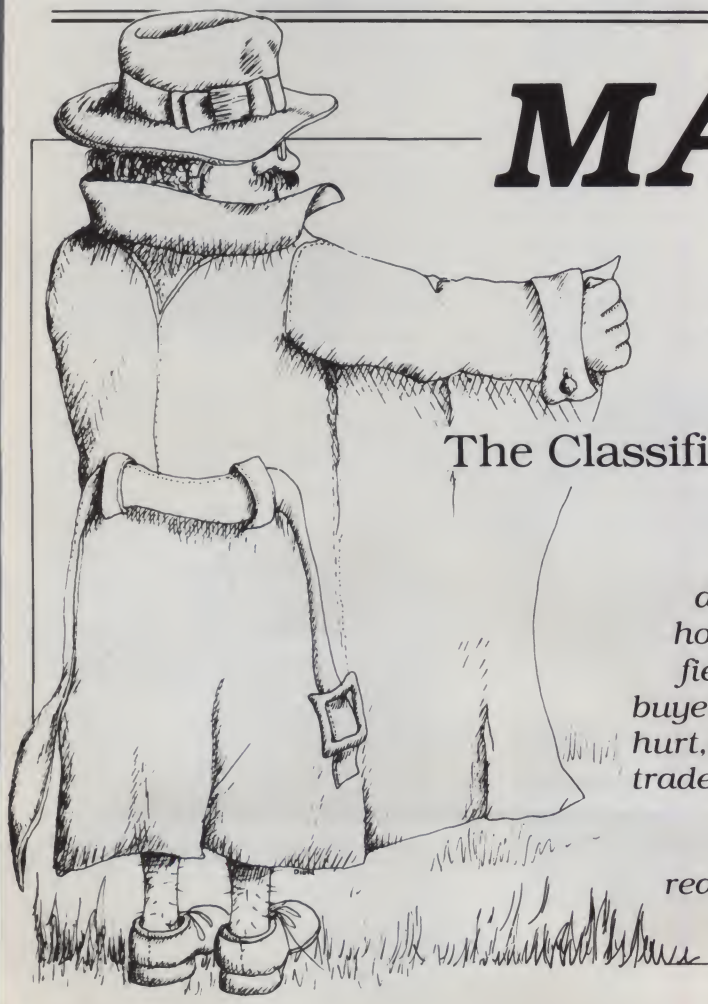

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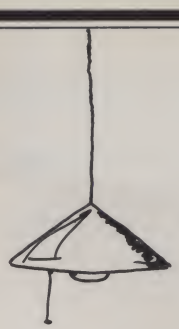
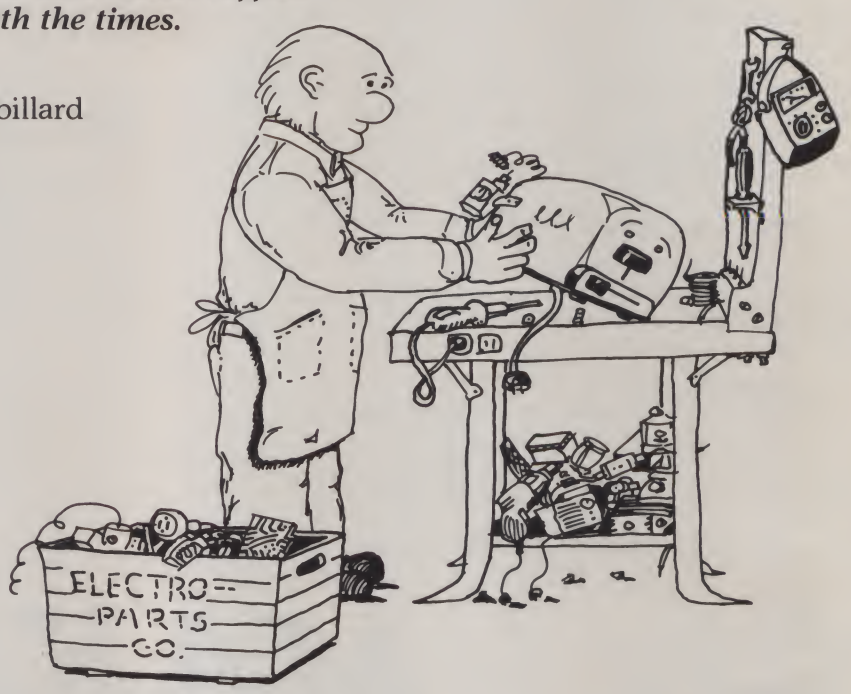


The home of the future will feature touch input systems. Design and construct your own video touch keypad and keep in touch with the times.

By Mark J. Robillard



The intelligent appliances we've all become accustomed to rely heavily on the touch surface. From microwave ovens to programmable blenders, these flat control areas tend to lend the convenience of easy, clean, trouble-free operation.

The home control information panels I proposed in the November 1982 *Microcomputing* (p. 46) incorporate this type of technology and one that is just now emerging on the market: the video touch screen.

In this article we will investigate several methods of sensing the touch of your finger as well as beginning the design and construction of a video touch keypad. First, the basics.

Keyboard Technology

Over the years the method of entering data into a computer or any other intelligent machine has hardly changed. The keypunch operator of yesteryear diligently punched away at a standard keyboard, creating input data for university computers.

Today we find all sizes, shapes and colors of the same standard keyboard affixed to personal computers. Only recently are voice recognition and video touch screens becoming accepted—and in rather disappointing numbers.

Several technologies are involved with the switch mechanism that

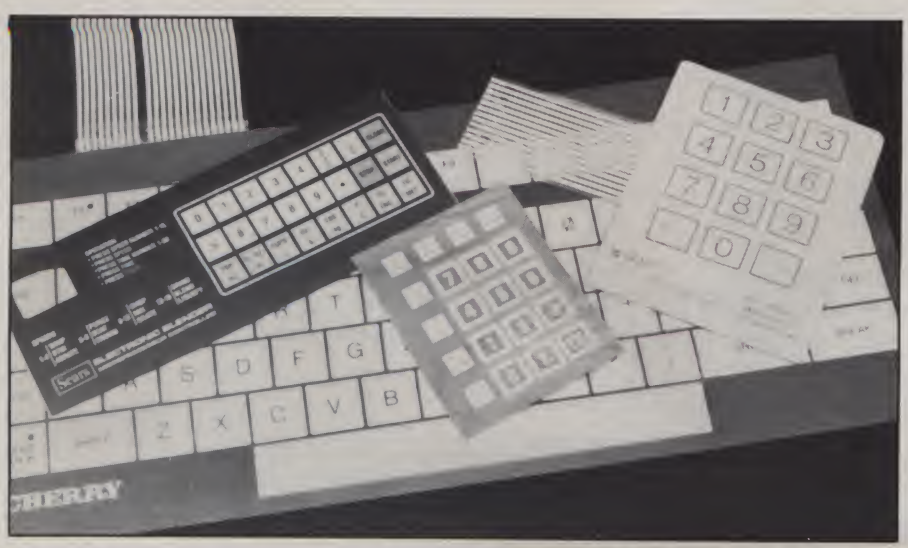


Photo 1. Various membrane panels that are available. The one shown from Cherry Electric (Waukegan, IL) is a full ASCII keyboard with tactile feel.

Address correspondence to Mark J. Robillard, 3 Peach Lane, Townsend, MA 01469.

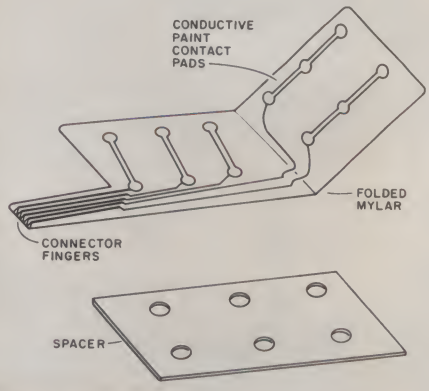


Fig. 1. Basic construction of the membrane-style keypad.

makes keyboard input possible: capacitive, hall-effect, membrane and sold cross point. But basically these switches either pass information or they don't.

Futuristic models of home information panels tend to exhibit a flat look. Mechanical keyswitches do not lend themselves to as low a profile as would appear to be necessary. The type of switch I had in mind for the panels is called the membrane.

Membrane switch panels are generally made the same. They start off with a sheet of mylar or similar material (Fig. 1). The connecting pattern and contacting areas of the switches are printed on the mylar.

Depending on the type of backing, the mylar may then be folded and another sheet (without printing) is inserted between the folded surfaces of the original piece. This acts as a space, keeping the conducting pads apart.

The spacer sheet is perforated with holes where the contact pads are located. These holes are not as large as the pads, but they do allow both pad areas to come in contact with one another at the pressure of a fingertip. Photo 1 shows various examples of membrane switch panels.

A custom panel switch like that shown in my home control panel ideas would cost several hundred dollars to have made professionally. The graphics on the front surface will have to be laid out and photographed; hole patterns will be die-cut into the spacer sheet. Both of these operations will require charges for layout personnel and die makers. But if it's so costly, why even bring it up?

Make Your Own

Membrane switch construction is probably the easiest thing you'll do in this series.

Start off by purchasing a sizable sheet of mylar at your local stationery store. The clerk might ask you to specify a thickness because mylar is available in various strengths. Remember that some "give" is required to produce the switch action, so don't jump at the ¼-inch thick mylar. Whether it is opaque or translucent doesn't matter.

Next, you'll want to purchase some adhesive-backed etch pads or metallic tape; the etch patterns made by Bishop Graphics (Westlake Village, CA 91359) work nicely. If you can't find a standard-size pattern, you can buy whole sheets of adhesive-backed copper, which enables you to work with the shape of your choice. Strips of narrow metalized tape can serve as interconnecting lines.

The graphics layer can be made of anything. I purchased adhesive-backed colored paper and used Datak Instant Lettering rub-offs to letter the panel. Finally, I used a clear sheet of adhesive-backed mylar to form a protective shield over the graphics.

In a later article, we will revisit these directions in the description of the actual construction of the kitchen information system.

Having the switch is one thing. Detecting finger depressions is another. Let's look at a few ways of signaling key presses.

In the simple 16-key switch panel schematic (Fig. 2) with electronic encoding, the 74LS148 IC being used transforms a low level on any one of its eight input lines into a three-bit binary number. As a bonus, it signals

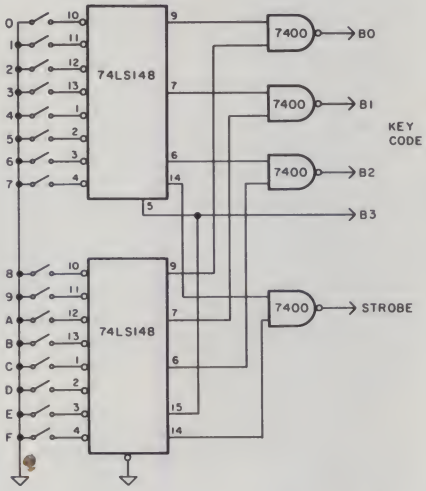


Fig. 2. Eight-switch electronic encoder. The 74LS148 will output a binary code for each line that is switched to ground.

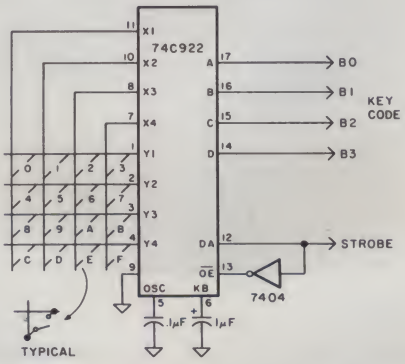


Fig. 3. Single-chip keypad encoder. The 74C922 contains all scan, debounce, code look-up and output latch circuitry. A 20-key version encoding a 4 x 5 keypad is available as the 74C923.

Just building that first touch panel, incorporating your own graphs, is a thrill

when a key press is detected.

This circuit assumes the panel is constructed of 16 individual switches with a common ground connected to all of them. The operation is obviously straightforward, and three ICs sure isn't much these days. Or is it?

Electronic Scanning

Have you noticed that many of the keypads on the market today are arranged not as individual switches but as X-Y matrixes? This type of layout arose from the pocket calculator, where space and circuitry was at a premium.

How does the matrix help reduce components? Well, for the 16-key example we just walked through, look at Fig. 3. That IC does everything the three-chip solution did—plus it debounces the keys (they actually *do* bounce upon opening and closing) and latches the output. It's made in low-power CMOS to help reduce components in the power supply. For larger examples, like the keyboard of a personal computer, similar single-chip products exist.

Still a bit foggy?

Assume the key lines arranged vertically are columns and the horizontal lines are rows. Check for the presence of a key closure by selectively placing a low (0) on each column sequentially. After asserting a low on a column, read the row lines to see which one is connected.

The circuit in Fig. 4 will stop counting upon a key closure and output a binary value with "key pressed signal." Basically, that's what's in one of those scanner chips. (Believe me, it's a lot easier hooking up one of those than building your own.)

The method used by the circuitry in all the figures can be emulated by the computer. Although our first application of the computer in the intelligent home series won't come until next month, I think it's appropriate to deal with it here.

Fig. 5 depicts the logic flow of a typical scanner system. Each column low is asserted and then the rows are tested.

With each test, a pointer that selects a place in memory where a table of key values is stored is incremented. When you find a key is pressed, the location pointed to in the table plus the value of the row input selects the key code that will be output.

Whichever way you choose to electronically encode your panel switches is fine. Just building that first touch panel, incorporating your own graphics, is a thrill. Making it work becomes secondary.

Sense of Touch

Is there any other solid state way of

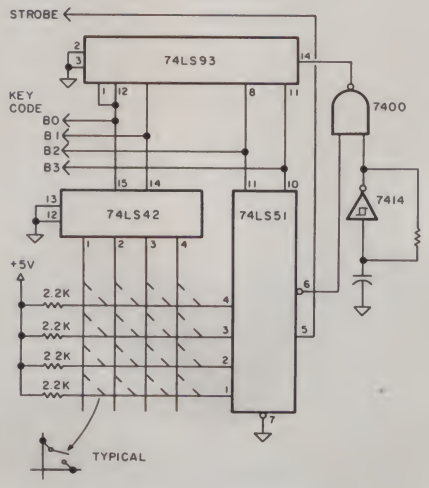


Fig. 4. Discrete circuitry required to implement a 4 x 4 scanned matrix encoder.

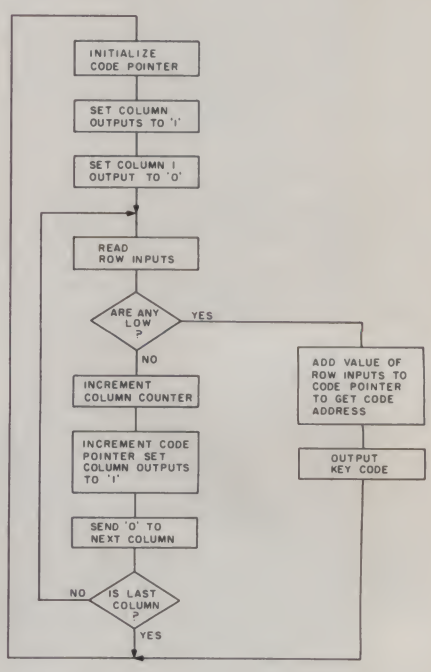


Fig. 5. Flowchart of operations to automatically scan a keypad using a computer.

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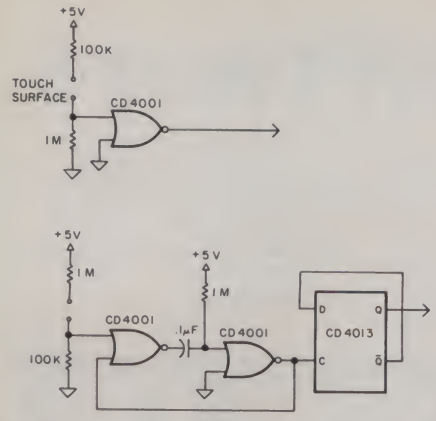

Fig. 6. Two electronic touch-sensing circuits. The circuit in (6a) will sense the touch and activate the output. The circuit in (6b) will latch the detection and toggle between on and off with successive touches.

sensing the touch of a finger? There certainly is—actual fingertip sensing can be done with simple CMOS circuits.

Figs. 6a and 6b show two ways of electronically sensing a touch. In both cases the resistance of the fingertip bridges across the two contact points which will initiate a switching action.

The unfortunate part of this design is the fact that it will require two contact points per switch. Granted, they could be mounted close together, but the finger still must bridge the two. Be sure these contacts are mounted on an insulating surface; a metallic one will cause switch operation.

The circuit is Fig. 6a shows a non-debounced logic output signal with fingertip sensing. Fig. 6b incorporates both a debounce circuit and a latch that will operate in the toggle mode. That is, one touch and the Q output will go high; the next touch will reset the Q output to 0.

There are some exciting possibilities, though, for mounting sensing pads. One way is simply to use wires. A graphics area painted or screened to look like a custom keyboard could incorporate two small holes per switch position. The sense wires would protrude from the rear of the panel to sit flush with the key face.

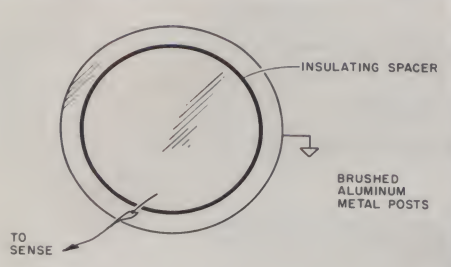

Fig. 7. Mechanical details of a ring-like touch pad. Outer and inner surfaces are made of brushed aluminum.

In another method (Fig. 7), the outer ring of the switch is the ground sense line; the entire center surface is made of brushed aluminum and is connected to the active sense line. When you touch the key, make sure you bridge the two.

One-Eyed Control

Still not satisfied? Well, there *is* one more way of detecting touch. In fact, it's the design approach I took for the kitchen information panel. It involves optoelectronics, which allows us to detect the presence of an object (finger) by interrupting a beam of light.

You probably have walked into a store that had an optical door chime. A beam of light emanates from a bulb on one side; the beam travels through the air on a fairly straight path to a photo cell light-detector on the other side.

As long as the beam of light is present, the circuit remains silent. If the photo cell does not detect the beam, as is the case when you walk between the two, a small door chime will indicate an entry. Some burglar alarm systems work the same way.

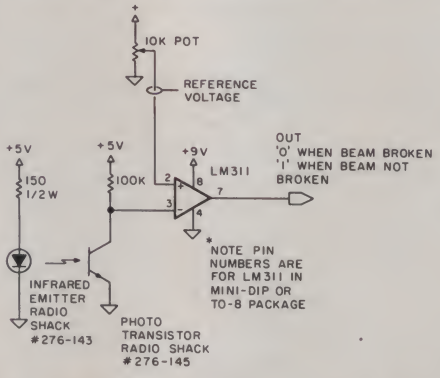

Fig. 8. Basic optical switch. Interruption of beam of infrared light between emitter and detector will cause the output of the comparator to activate. Adjust reference pot for sensitivity.

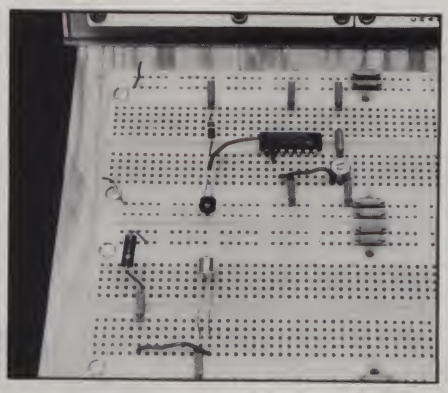

Photo 2. Breadboard showing how simple it is to construct an optical switch shown in Fig. 8.

It became apparent, however, that the beam of light from an ordinary bulb wasn't enough. For instance, a burglar could carry around a penlight flashlight to shine in the photo cell while breaking the main beam. The photo cell, a nonintelligent device, won't squawk because to a photo cell, light is light. Another reason is the fact that normal room or outdoor lighting will affect the operation, making the systems somewhat unreliable.

The light bulb has been replaced by a familiar element . . . the LED. However, this LED displays light that is not detectable by our eyes. In fact, when you turn it on, you'll swear you didn't! If you team this up with an optical detector that only responds to that kind of light, you have a pretty reliable system.

Fig. 8 shows the schematic of a simple one-line optical switch using infrared LEDs and detectors from Radio Shack. Placing your finger between the LED and phototransistor will cause change in voltage at the negative input to the comparator.

Adjust the 10K pot so that the voltage on the positive input equals the level of the other. When you do this the output will switch low. Removing your finger will cause the voltages to be different again, which causes the comparator to turn off. Later, we'll use eight of these circuits to create an optical touch keyboard.

The circuit in Fig. 8 is capable, using the parts specified, of detecting a beam up to two feet away. However, the detector is directional; the beam from the LED must have a clear line-of-sight shot at the detector for proper operation.

In applications where you might want to send data over this optical link, you could simply connect the output of a UART to the LED. This would turn on and off (modulate) the beam according to the bit stream. Connecting the comparator output to a UART receiver input will decode (demodulate) this data for processing by a computer system.

Next month, we'll get back to home control and we'll cover the use of these touch circuits in actual information panel systems. We'll also touch on how communications to the panels are handled in the Unimem system.■

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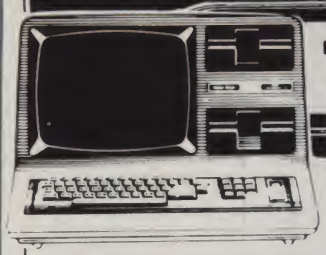

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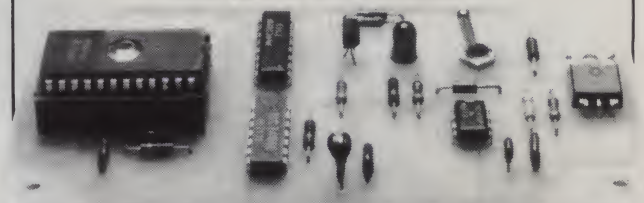

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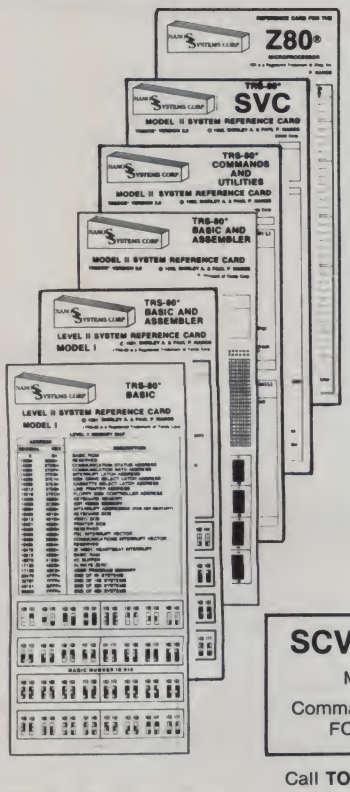

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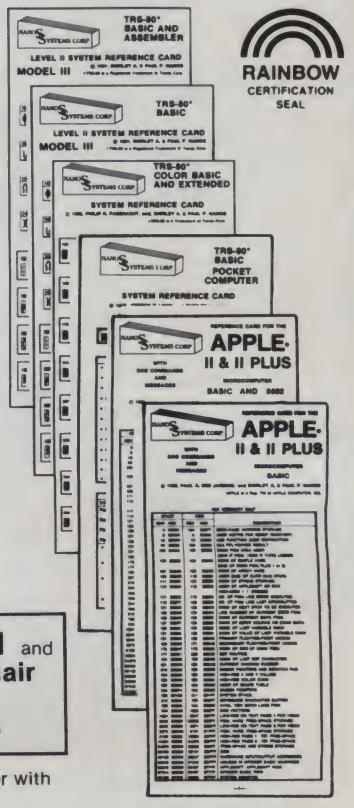

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Healthful Hints from Heath

How susceptible are you to a heart attack? This Heath program can help you reduce the risk and worry.

By D. C. Shoemaker

Program listing. Cardiovascular disease risk assessment program for the Heath system.

```
10 'This program is intended to provide a guide to heart disease risk.
20 'It is only a guide.  Consult your physician for more exact information
30 'Written in Microsoft BASIC by D.C. Shoemaker
40 '
50 PRINT CHR$(27);"E"' Clear the H19/H89 screen
60 '
70 PRINT,"This program will help you assess your present risk of heart"
80 PRINT,"disease.  It is a guide only; for more exact information, you"
90 PRINT,"should consult your physician.":PRINT
100 PRINT,"To use the program, just answer the questions as presented."
110 PRINT
120 PRINT,"First, age.  Choose from the following age groups:":PRINT
130 PRINT,,"1 - ten to twenty years old"
140 PRINT,,"2 - twenty one to thirty years old"
150 PRINT,,"3 - thirty one to forty years old"
160 PRINT,,"4 - forty one to fifty years old"
170 PRINT,,"5 - fifty one to sixty years old"
180 PRINT,,"6 - sixty one and over":PRINT
190 PRINT,,:INPUT"What is your age category (1-6)";A
200 IF A<1 OR A>6 THEN 110
210 IF A=5 THEN A=A+1
220 IF A=6 THEN A=A+2
230 PRINT CHR$(27);"E"
240 PRINT,"Next is the heredity factor.  Select from the following:":PRINT
250 PRINT,"1 - no known history of heart disease in the family"
260 PRINT,"2 - one relative with cardiovascular disease, over sixty"
270 PRINT,"3 - two relatives with cardiovascular disease, over sixty"
280 PRINT,"4 - one relative with cardiovascular disease, under sixty"
290 PRINT,"5 - two relatives with cardiovascular disease, under sixty"
300 PRINT,"6 - three relatives, under sixty":PRINT
310 PRINT,,:INPUT"What category (1-6)";H
320 IF H<1 OR H>6 THEN 230
330 IF H=5 THEN H=H+1
340 IF H=6 THEN H=H+1
350 PRINT:PRINT
360 PRINT,"Now for your weight.  Choose from the following:":PRINT
370 PRINT,,"1 - more than 5 pounds under the standard weight"
380 PRINT,,"    for your height"
390 PRINT,,"2 - between -5 and +5 pounds of the standard"
400 PRINT,,"3 - 6 to 20 pounds overweight"
410 PRINT,,"4 - 21 to 35 pounds overweight"
420 PRINT,,"5 - 36 to 50 pounds overweight"
430 PRINT,,"6 - more than 51 pounds overweight":PRINT
440 PRINT,,:INPUT"Which category (1-6)";W
450 IF W<1 OR W>6 THEN 350
460 W=W-1
470 IF W=4 THEN W=W+2
480 IF W=5 THEN W=W+2
490 PRINT CHR$(27);"E"
500 PRINT,"Smoking habits are next.  Select from the following groups:":PRINT
510 PRINT,,"1 - non-smoker"
520 PRINT,,"2 - cigar and/or pipe"
530 PRINT,,"3 - 10 or fewer cigarettes per day"
540 PRINT,,"4 - 20 cigarettes a day"
550 PRINT,,"5 - 30 cigarettes a day"
560 PRINT,,"6 - 40 or more cigarettes a day":PRINT
570 PRINT,,:INPUT"What is your category (1-6)";T
580 IF T<1 OR T>6 THEN 490
590 T=T-1
600 IF T=3 THEN T=T+1
610 IF T=4 THEN T=T+2
620 IF T=5 THEN T=T+3
630 PRINT:PRINT
640 PRINT,"Now for your exercise patterns.  Choose from:":PRINT
650 PRINT,,"1 - intensive occupational and recreational exertion"
660 PRINT,,"2 - moderate occupational and recreational exercise"
670 PRINT,,"3 - sedentary work and intense recreational exercise"
680 PRINT,,"4 - sedentary occupational and moderate recreational"
```

More →

Worried about a computer-induced coronary? Well, computer use isn't a legitimate cause of heart failure, but just the same, here's a simple program that can help you assess your own susceptibility to heart attack. It provides an analysis of certain risk factors that through tests, research and experience have become associated with *cardiovascular* disease.

Naturally, such a simple program cannot begin to take into consideration all the factors and elements that contribute to heart disease. Nevertheless, this program may prove to be of some help.

The original idea for the program came from an article appearing in the November 1981 issue of "Executive Health," a monthly newsletter published by Porter Shimer (Rodale Press, Inc., 33 East Minor Street, Emmaus, PA 18049).

Risk Factors

The article included a risk analysis chart that was laid out in the form of a two-way matrix, from which the reader could select the appropriate value for each risk factor and then total the factors and interpolate the total risk from a table. It seemed like a natural for computerization. Before you begin, count parents, grandparents, brothers and sisters who have suffered a stroke or a heart attack, and then check your cholesterol level and blood pressure.

To assess your cholesterol level, obtain a blood level reading. If you can't get one (it should have been done at your last physical—when was that?), you can estimate the percentage of solid fats you eat in your diet. (It's important to be honest in your

estimate of fat intake.) The harmful ones tend to be the animal fats—cream, butter, beef and lamb fat and lard. The average American's cholesterol level is 40 percent, and that's far too high for good health.

Blood pressure readings can be obtained from medical facilities or at health clinics.

You should note the relation of sex, age and heredity to heart disease. These three factors are the only ones you cannot control. The risk of heart disease *can* be controlled, at least to an extent, by means of diet, exercise, reduced smoking and a few other factors.

Listing continued.

```
690 PRINT,,"    exercise"
700 PRINT,,"5 - sedentary work and light recreational exercise"
710 PRINT,,"6 - complete lack of all exercise":PRINT
720 PRINT,,:INPUT"Which category (1-6)";E
730 IF E<1 OR E>6 THEN 630
740 IF E=4 THEN E=E+1
750 IF E=5 THEN E=E+1
760 IF E=6 THEN E=E+2
770 PRINT CHR$(27);"E"
780 PRINT,"The amount of cholesterol or fat per cent in your diet is next."
790 PRINT,"You may choose from the following:":PRINT
800 PRINT,"1 - cholesterol below 180 mg.%; diet contains no animal"
810 PRINT,"    or solid fats"
820 PRINT,"2 - cholesterol 181-205 mg.%; diet contains 10% animal"
830 PRINT,"    or solid fats"
840 PRINT,"3 - cholesterol 206-230 mg.%; diet contains 20% animal"
850 PRINT,"    or solid fats"
860 PRINT,"4 - cholesterol 231-255 mg.%; diet contains 30% animal"
870 PRINT,"    or solid fats"
880 PRINT,"5 - cholesterol 256-280 mg.%; diet contains 40% animal"
890 PRINT,"    or solid fats"
900 PRINT,"6 - cholesterol 281-300 mg.%; diet contains 50% animal"
910 PRINT,"    or solid fats":PRINT
920 PRINT,,:INPUT"What category (1-6)";C
930 IF C<1 OR C>6 THEN 770
940 IF C=6 THEN C=C+1
950 PRINT CHR$(27);"E"
960 PRINT,"Now for your blood pressure.  Select from the following:":PRINT
970 PRINT,,"1 - upper reading of 100"
980 PRINT,,"2 - upper reading of 120"
990 PRINT,,"3 - upper reading of 140"
1000 PRINT,,"4 - upper reading of 160"
1010 PRINT,,"5 - upper reading of 180"
1020 PRINT,,"6 - upper reading of 200 or over":PRINT
1030 PRINT,,:INPUT"Which category (1-6)";P
1040 IF P<1 OR P>6 THEN950
1050 IF P=5 THEN P=P+1
1060 IF P=6 THEN P=P+2
1070 PRINT:PRINT
1080 PRINT,"Finally, your sex.  Choose from the following:":PRINT
1090 PRINT,,"1 - female under age 40"
1100 PRINT,,"2 - female of age 40 to 50"
1110 PRINT,,"3 - female over 50"
1120 PRINT,,"4 - male"
1130 PRINT,,"5 - stocky male"
1140 PRINT,,"6 - bald, stocky male":PRINT
1150 PRINT,,:INPUT"And your category (1-6)";S
1160 IF S=4 THEN S=S+1
1170 IF S=5 THEN S=S+1
1180 IF S=6 THEN S=S+1
1190 '
1200 'Tally the factors
1210 '
1220 GT=A+H+W+T+E+C+P+S
1230 PRINT CHR$(27);"E"
1240 PRINT,"Results of this short quiz suggest that, based on your"
1250 PRINT,"answers to the questions, in light of currently accepted"
1260 PRINT,"standards, your risk of suffering a heart attack is"
1270 '
1280 'Determine the appropriate response
1290 '
1300 IF GT>40 THEN 1360
1310 IF GT>31 THEN 1380
1320 IF GT>24 THEN 1390
1330 IF GT>17 THEN 1400
1340 IF GT>11 THEN 1410
1350 GOTO 1420
1360 PRINT,"at a dangerous and urgent level.  You should see your"
1370 PRINT,"physician now.":GOTO 1430
1380 PRINT,"at a dangerous level.":GOTO 1430
1390 PRINT,"moderate.":GOTO 1430
1400 PRINT,"generally below average.":GOTO 1430
1410 PRINT,"below average.":GOTO 1430
1420 PRINT,"well below average."
1430 PRINT:PRINT
1440 PRINT,"You should bear in mind that this simple analysis of your risk"
1450 PRINT,"factors reflect medical conditions and habits associated with"
1460 PRINT,"an increased danger of heart attack.  It neither means that you"
1470 PRINT,"will or won't suffer one, but merely suggests potentials.  Not"
1480 PRINT,"all factors can be quantified this simply and easily.":PRINT
1490 PRINT,"You should be guided in this, as in all matters of health, by"
1500 PRINT,"competent medical advice.  This computer program is not a"
1510 PRINT,"substitute for that."
1520 END
```

Microcomputing welcomes conversions of this program for the Apple, Atari, Commodore and IBM microcomputer systems.

Program Operation

To run the program, just select the correct range for each risk factor and the program will tally the results and provide a printed assessment of your risk. Those who are interested in the factors and their weights will find them in the body of the program; I won't repeat them here.

A couple of other things are worth pointing out. First, note that I used commas after most Print statements; this centers the text on H19 terminals. Delete the commas if your screen is less than 80 columns wide. The version of Basic used is Microsoft 4.82; any other dialect of Basic should work equally well with virtually no changes.

In some lines you'll see constants added to the risk factor variables. This is in accordance with the reference article from "Executive Health," where it was necessary to weigh increasing levels of certain risk factors. For instance, the relationship of smoking to heart disease is not linear; increasing levels of smoking show an accelerated increase in the risk of heart attack.

I generally refrained from using compound statements (i.e., more than one statement per line) except in obvious cases, such as multiple print commands or when an input follows a Print statement. If these cases pose problems for your interpreter, just separate them onto different lines.

Finally, let me repeat that this program serves only as a simple analysis of factors known to have a bearing on cardiovascular disease. It's not meant to take the place of regular physical examinations, proper diet and exercise patterns. It's merely *intended to* let you and your family and friends assess the risk of heart disease and to suggest ways in which you can adjust those factors to reduce the risk.

You wouldn't use an artificial intelligence program like Eliza to diagnose potential mental problems; don't use this one to diagnose potential heart disease. It is not a substitute for good medical advice.■

Address correspondence to D.C. Shoemaker, HQ USEUCOM Box 897, APO NY 09128.

VIC Invades Space

Astrophotography and microcomputing—a match made in heaven. All you need to focus in on celestial bodies are a VIC-20 microcomputer to control your camera and a starry night.

By John M. Franke

After several hundred hours of saving the galaxy from foreign invaders, I had to put my VIC-20 to some real work.

One of my hobbies is astrophotography. I've always wanted to photograph a meteor burning up as it streaked across the night sky, but I couldn't see staying up past midnight to operate the camera. So it seemed reasonable to use my VIC-20 to take the photographs. Such photos are not only interesting, but they're valuable for determining the celestial coordinates of the meteor radiant.

Requirements

What I needed was a simple contact closure that could be programmed to close at specific times or at constant intervals. Normally, meteor photographs are made by opening the camera shutter for one to 30 minutes for each exposure; ten or more exposures are made per night.

The VIC has an internal clock that is incremented 60 times a second. The clock resets to 0 upon power-up and can be set to the present, or any other time, by entering TI$ = "HHMMSS". [HH equals hours (0–23), MM equals minutes (0–59) and SS equals seconds (0–59).]

This feature satisfied the requirement for a system clock for scheduling the photographs and timing the exposures. The second requirement, a switch closure, was somewhat harder to find.

Scanning through the *VIC-20 Programmer's Reference Guide*, I noticed that the CB2 line on the user port had a manual-control feature. This line is normally used as a handshaking line for communicating with printers.

According to page 176 of the *Reference Guide*, CB2 is controlled by bits 5, 6 and 7 of a byte poked into memory location 37148 decimal. A pattern of 110 will set CB2 low and 111 will set CB2 high (see page 222).

Listing 1. Camera-controlling program.

```
100  DIM N1 (100), N2(100)
110  POKE37148,192
120  PRINT " ↓ ":PRINT"CURRENT TIME, HHMMSS":INPUTA$
130  TI$=A$
132  PRINT:PRINT"MODE":PRINT
133  PRINT"1 SPECIFIC TIMES":PRINT"2 CONSTANT INTERVALS"
135  INPUT    Q
140  PRINT:PRINT"HOW MANY PHOTO'S":INPUT N
145  ON Q GOTO 150,500
150  FORX=1TON
160  PRINT:PRINT"PHOTO ",X,"  START?,HHMM":INPUT  N1(X)
170  PRINT:PRINT"PHOTO ",X,"  DURATION?,MM":INPUTN2(X):PRINT
180  NEXT X
185  PRINT " ↓ "
190  PRINT "PROGRAM RUNNING"
192  PRINT:PRINT"1ST PHOTO-",N1(1)
200  K=1
210  R=INT(VAL(TI$)/100)
220  IFR-N1(K)=0THEN 240
230  GOTO 210
240  POKE37148,224:PRINT:PRINT"PHOTO       STARTED",K,R
250  F=N1(K):F2=N2(K)
260  F1=F-INT(F/100)*100
270  IF(F1+F2)>59THEN 300
280  J=F+F2
290  GOTO 302
300  J=F+F2+40
302  IFJ < 2400THEN 310
303  J=J-2400
310  R1=INT(VAL(TI$)/100)
```

(Continued on page 54)

Address correspondence to John M. Franke, 1310 Bolling Ave., Norfolk, VA 23508.

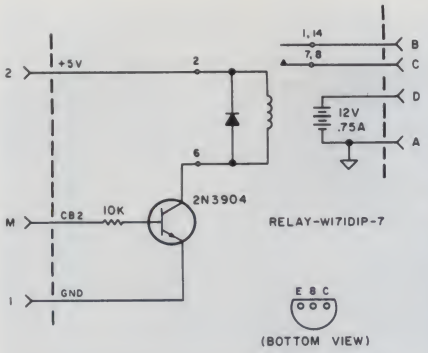


Fig. 1a. Computer interface and relay driver.

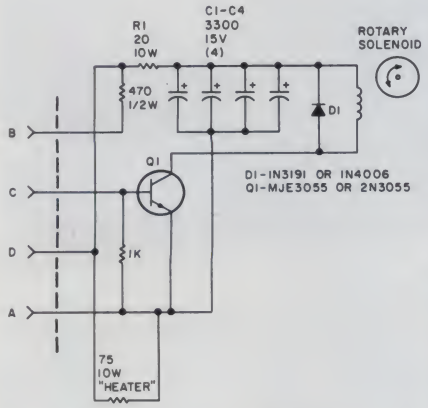


Fig. 1b. Computer interface and shutter solenoid driver.

Hence, Poke 37148,192 will set CB2 low and Poke 37148,224 will set CB2 high. Life couldn't be much simpler.

I use CB2 for relay control (Fig. 1a); this provides electrical isolation between the VIC-20 and the camera.

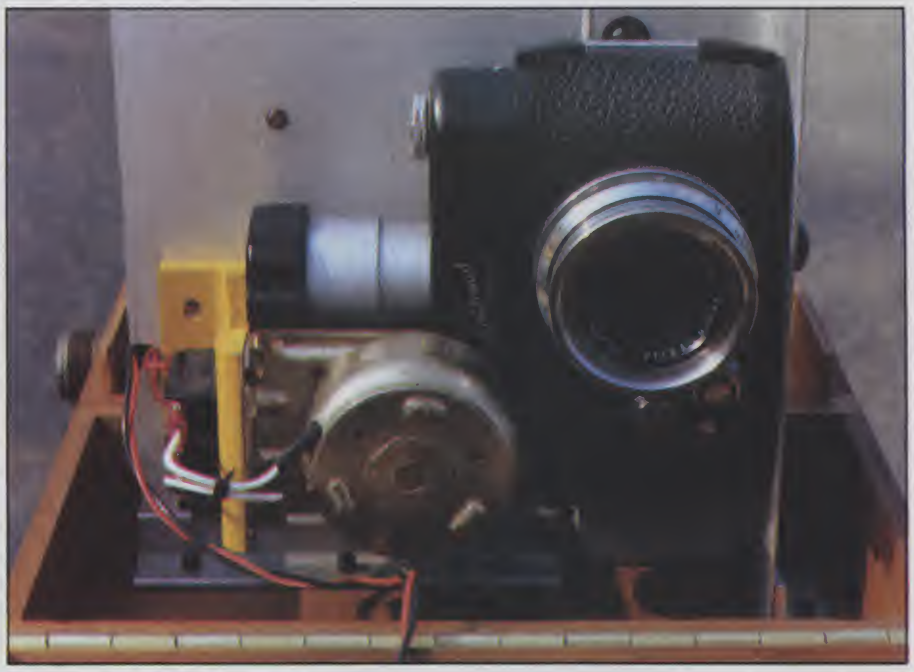
You can use modern single-lens reflex cameras that are equipped with a motorized winder for this application. However, my camera doesn't have that feature.

The camera I use is an old spring-wound German "Robot" camera. It has a manual shutter and automatically advances the film when the shutter is released.

My camera's image format is 23mm by 23mm, not the customary 24mm by 36mm. This reduced format permits 48 exposures to be made on a 36-exposure roll.

The shutter, in this application, is operated with a rotary solenoid salvaged from a surplus remote switching unit. The actuation current is one Ampere, but the holding current is only 300 milliamperes. The capacitor bank C_1–C_4 supplies the actuation current. R_1 limits the holding current when the shutter is closed and recharges the capacitor bank when the shutter opens.

Front view of meteor camera in environment enclosure.



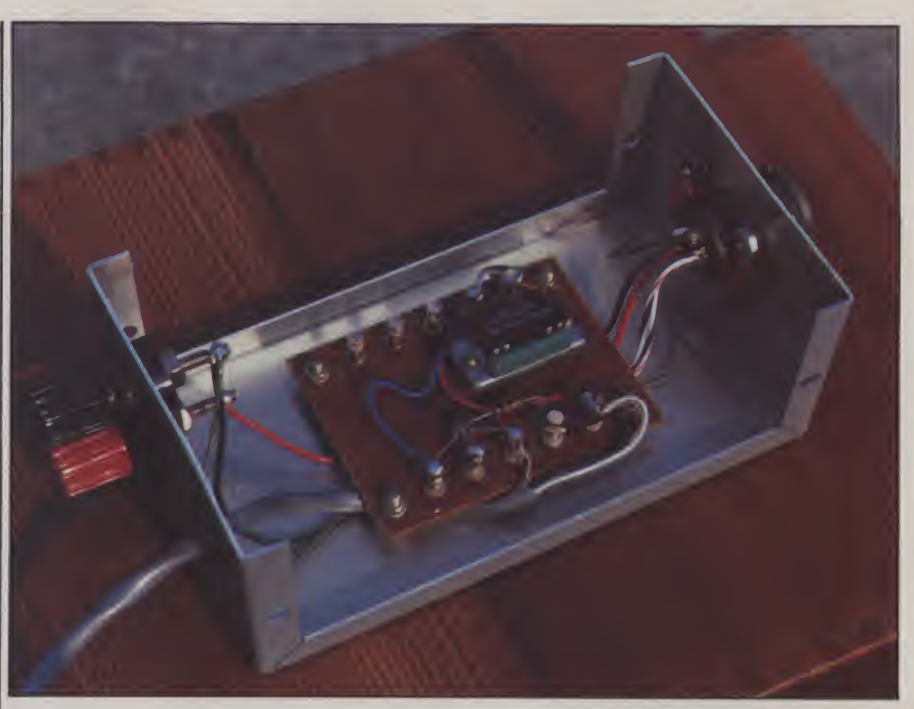
Meteor camera opened, showing "Robot" camera and solenoid.

The bank will recharge in less than two seconds. The MJE3055 switching transistor, which I selected because it was in my junk box, is protected from the inductive kickback from the solenoid by D_1. A 75-ohm resistor is bolted to the camera enclosure window frame to supply enough heat to keep the window free of frost and dew.

The Program

The program flowchart (Figs. 2a and 2b) reveals the simplicity of the program, which is divided into two sections. The loading section uses one of two methods to build the exposure time and duration tables N1 and N2, respectively. The operating section checks the present or real time against the first entry in N1 and opens the shutter when a match occurs. N2 determines when the shutter is closed. Then the real time is compared with the next entry in N1 and so on.

The program listing is short compared to most programs. Line 100 dimensions the N1, N2 tables. Line 110 closes the shutter. Lines 120 and



Meteor camera computer interface.

130 set the VIC-20 clock to the present time. Lines 132 through 145 inquire as to whether specific times are to be stored or if exposures with constant interval spacing will be programmed; they also specify the total number of photos to be taken.

Lines 150 through 180 merely request the specific times and exposure durations for the specific time mode. Lines 500 through 660 are used to build N1 and N2 for the constant interval mode.

Lines 580 through 610 strip the hour digits from the start time and then add the remaining minutes to check if the sum exceeds 59 (this accounts for carryovers to the hour digits). Lines 620 and 630 likewise test the hour digits for times after midnight.

The operating section starts at line 185. Lines 200 through 340 check the real time against the table entries, open the shutter when a match occurs, add N2 to N1 and close the shutter when the real time equals the sum of N2 and N1. Line 350 is a time delay loop that allows the film to advance and the capacitor bank to recharge. After the last exposure, the program ends at line 390.

Don't Forget the Film

With this program, I merely load in the mode and time information, turn on the camera supply, turn off the lights and return the next morning to unload and develop the film.

The average time to record a non-shower meteor is 100 hours. Photographing on nights of known showers should yield several meteors per hour

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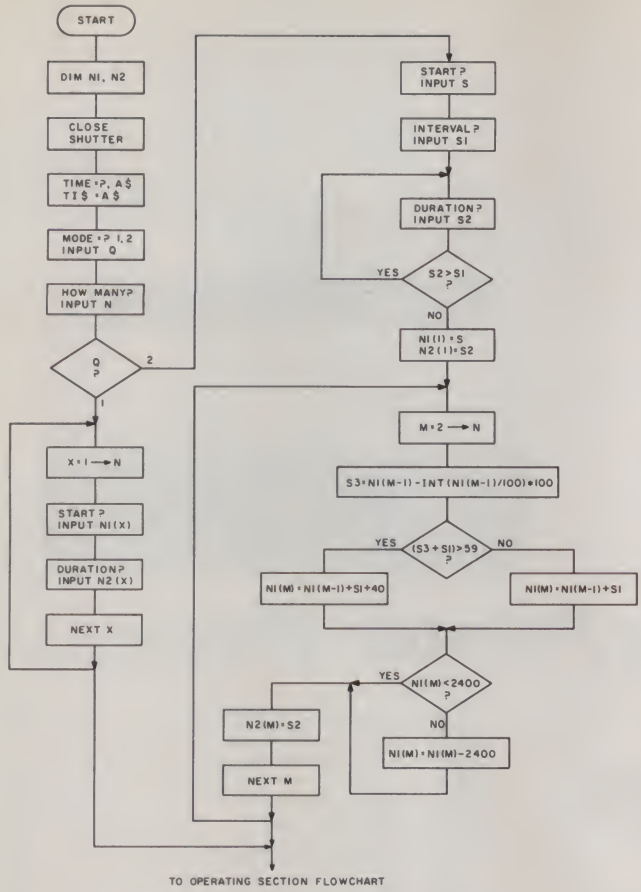

Fig. 2a. Camera-loading section of program.

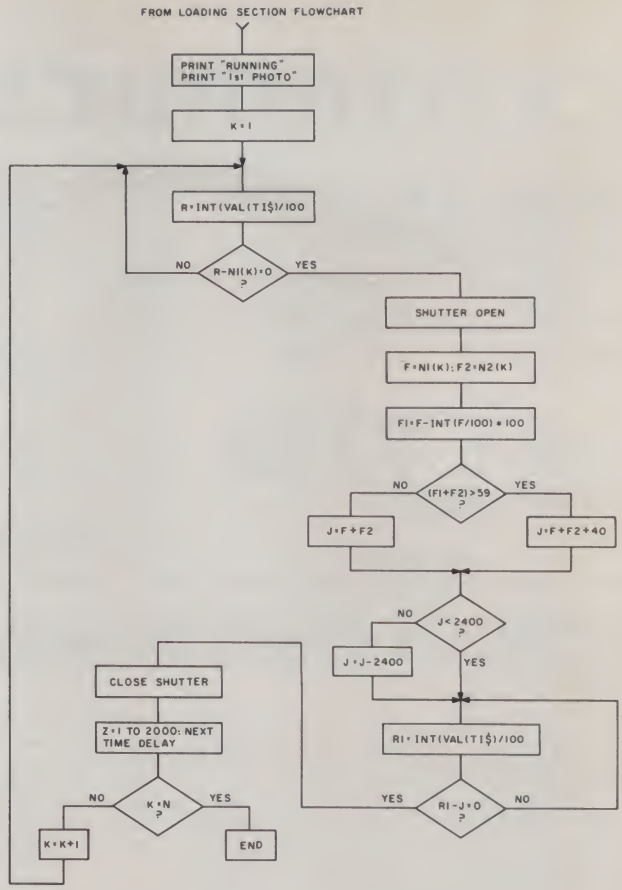

Fig. 2b. Operating section of camera.

of exposure. The meteor trail is readily visible against the starry background. The stars form short arcs representing their apparent motion during the four-minute exposure. Stars furthermost from Polaris, the pole star, exhibit longer trails.

While this program was used to control a camera, it would be just as easy to control a day/night thermostat, a coffee pot or room lighting simply by Poking CB2 on and off. Use of the PB0–PB7 lines would allow control of 128 different devices. PB0–PB6 could be externally decoded to address each device and the state of PB7 could determine the state of the selected device.

Alternately, some of these lines could be programmed for input instead of output and their status monitored using Peeks to direct the program. This concept will be used to control a more advanced camera. The computer will control not only the shutter, but also motors that will aim the camera and track the stars.■

(Listing continued from page 50)

```
320  IF R1-J=OTHEN340
330  GOTO 310
340  POKE37148,192:PRINT"SHUTTER CLOSED",R1
350  FORZ=1TO2000:NEXT
360  IF K=N  THEN390
370  K=K+1
380  GOTO 210
390  PRINT"RUN COMPLETE":END
500  PRINT:PRINT"SEQUENCE START,HHMM":INPUT S
520  PRINT:PRINT"PHOTO INTERVALS,MM":INPUT S1
540  PRINT:PRINT"EXPOSURE TIME,MM":INPUT S2
560  IF S2 > S1THEN540
565  N1(1)=S: N2(1)=S2
570  FORM=2TON
580  S3=N1(M-1)-INT(N1(M-1)/100)*100
590  IF(S3+S1) > 59THEN 610
600  N1(M)=N1(M-1)=S1:GOTO620
610  N1(M)-N1(M-1)+S1+40
620  IFN1(M) < 2400THEN640
630  N1(M)=N1(M)-2400
640  N2(M)=S2
650  NEXT M
660  GOTO 185
```

This photograph shows a meteor captured with this system between 1:55 and 1:59 a.m. EST on Aug. 22, 1982, after nearly 40 hours of exposure.

Look at That Sound

By Ken Reid

Transform the sounds of earthquakes and handclaps into photographs using an oscilloscope and a Cromemco D+7A board converter.

```
SET UP INITIAL PARAMETERS

        GET WAIT COUNT FROM CALLING PROGRAM
        GET THRESHOLD FROM CALLING PROGRAM
        SET COUNTER FOR NUMBER OF POST-EVENT POINTS TO SAVE
        SET INITIAL BUFFER LOCATION

SAVE DATA POINTS AND TEST FOR EVENT

 LOOP1: GET DATA POINT
        SAVE IT IN BUFFER
        WAIT
        INCREMENT BUFFER LOCATION
        COMPARE DATA PT WITH THRESHOLD
        IF POINT IS BELOW THRESHOLD, GO TO LOOP1
        GET DATA POINT
        SAVE IT IN BUFFER
        WAIT
        INCREMENT BUFFER LOCATION
        COMPARE DATA PT WITH THRESHOLD
        IF POINT IS BELOW THRESHOLD, GO TO LOOP1

EVENT DETECTED - SAVE POST-EVENT DATA POINTS

 LOOP2: GET DATA POINT
        SAVE IT IN BUFFER
        WAIT
        INCREMENT BUFFER LOCATION
        DECREMENT POINT COUNTER
        IF COUNT IS NOT ZERO, GO TO LOOP2

        SAVE LAST BUFFER LOCATION USED
        RETURN TO CALLING PROGRAM
```

Listing 1. Quasi-machine-language program for reading data into a ring buffer, detecting an event (two successive data points above a fixed threshold) and then saving postevent segment of data in the same ring buffer. Successive increments to the buffer cause it to overflow, closing the ring. An eight-bit buffer address overflows modulus 256. Other buffer sizes can be used with appropriate programming.

If you have an interest in thunderstorms, earthquakes, electrical transients or the sound of one hand clapping, you'd probably be interested in using a "waveform camera." This device can trigger and hold a waveform when it occurs and display the captured waveform on an oscilloscope screen or plotter for your examination.

Several elaborate and expensive digital oscilloscopes have circuits that can trigger waveforms. To perform this function using an Apple II computer, an Applescope plug-in ($595 from R. C. Electronics, Inc., 7265 Toulume Street, Goleta, CA 93117) is necessary.

The best digital oscilloscopes have an additional refinement—some of the trace prior to the trigger is stored so that you can look at events before and after the triggering signal.

Easy as Breaking Glass

It's not difficult to accomplish. If you have a microcomputer with analog-to-digital conversion capability, the program described below will let you trap and display unpredictable events at your leisure. For example, the sounds of glass breaking, hands clapping and pencils tapping are captured and displayed in the accompanying photographs (see p. 60).

The A/D converter I use is the Cromemco D+7A board (S-100 bus), which provides seven A/D and seven D/A channels at eight-bit precision. It also provides a parallel port. (Analog and digital interfaces are described in detail in a two-part article by Rod

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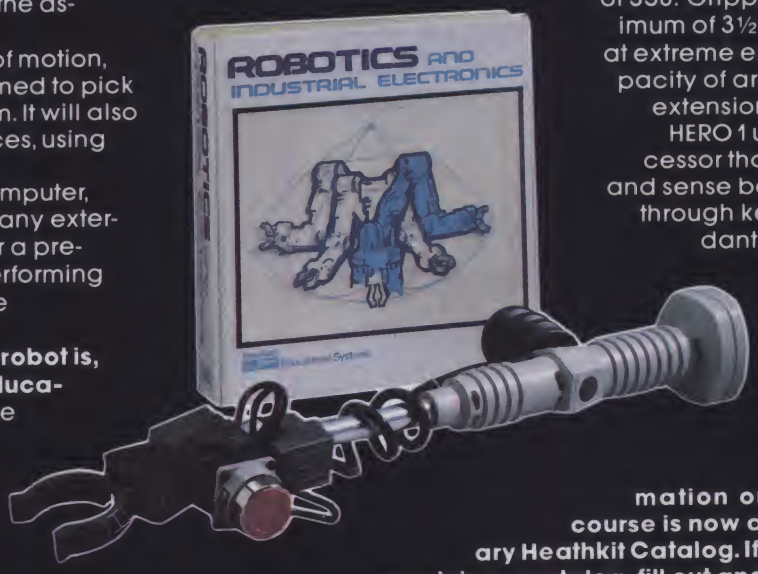

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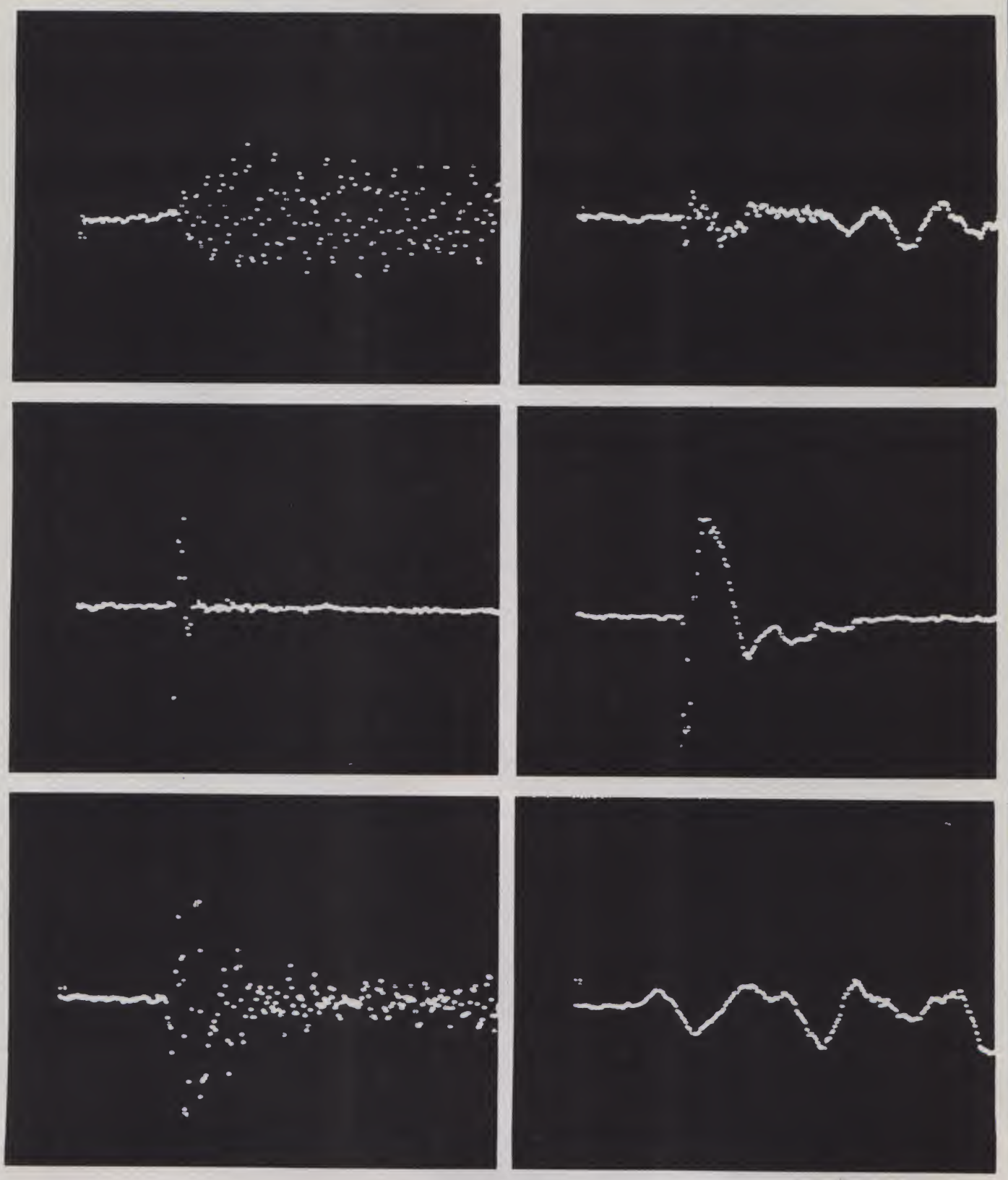

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The middle row shows the sound pattern produced by breaking a small glass tube close to the microphone. The sound begins abruptly and is over in about 0.002 second, as shown at low speed (left) and high speed (right).

On the bottom row, the sound pattern of a handclap (in a room with hard walls) is shown. The echos bouncing around the room after the clap can be seen in the lower left photo. The high-speed trace at right shows that handclaps begin much more gradually than the snap of breaking glass, or even a tap on a door (upper right).

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Hallen in the March and May 1979 issues of *Microcomputing*.)

The heart of the program is a recycling buffer that is fed continuously from the signal being monitored. When the "event" is detected, the buffer contains data from the period just prior to it. In the version here, the data that preceded the event is saved and data showing the triggering event itself is loaded into part of the buffer.

A simplified listing is shown in Listing 1. A realization of this in Z-80 assembly language is given in Listing 2. This listing also contains a display section, which uses two digital-to-analog converters to create a display on a standard oscilloscope. A total of 256 repetitions of the sweep lasts about 3.5 seconds—long enough to decide whether it is worth saving.

```
; SET UP INITIAL PARAMETERS

        POP     BC              ;get wait count in B
                                ;threshold in C
        LD      D,0BFH          ;count of post-trig pts
        LD      E,B             ;wait count
        LD      HL,0FA00H       ;start of buffer
;
; SAVE DATA POINTS AND TEST FOR SPIKE
;
LOOP1:  IN      A,(19H)         ;get data point
        LD      (HL),A          ;save it in buffer
        LD      B,E             ;wait count
WAIT1:  DJNZ    WAIT1           ;wait loop
        INC     L               ;buffer address, lower 8 bits
        CP      A,C             ;compare pt with threshold
        JP      M,LOOP1         ;loop if below threshold
        IN      A,(19H)         ;get next data pt
        LD      (HL),A          ;save it
        LD      B,E             ;wait count
WAIT2:  DJNZ    WAIT2           ;wait
        INC     L               ;buffer address, lower 8 bits
        CP      A,C             ;compare pt with threshold
        JP      M,LOOP1         ;loop if below threshold
;
; SPIKE DETECTED - SAVE POST-SPIKE POINTS
;
LOOP2:  IN      A,(19H)         ;get data point
        LD      (HL),A          ;save in buffer
        LD      B,E             ;wait count
WAIT3:  DJNZ    WAIT3           ;wait
        INC     L               ;buffer address, lower 8 bits
        DEC     D               ;point counter
        JR      NZ,LOOP2        ;get next data point
;
; DATA COLLECTION COMPLETED - DISPLAY RESULT
;
        LD      DE,0080H        ;min X coord is -128
LOOPD:  LD      A,E             ;current value of X
        OUT     1B,A            ;to CRO X input
        LD      A,(HL)          ;current data pt
        OUT     1A,A            ;to CRO Y input
        INC     E               ;next X
        INC     L               ;next Y
        LD      A,7FH           ;max value of X is 127
        CP      A,E             ;is sweep complete?
        JR      NZ,LOOPD        ;loop if not done
        DEC     D               ;count to 256 sweeps
        JR      NZ,LOOPD        ;loop if not done
;
; DISPLAY COMPLETED WHEN CONTENTS OF D = 0
;
        LD      E,L             ;save final buffer loc in DE
        RET                     ;to return to calling program
```

Listing 2. Implementation of the program for a Z-80 microcomputer. Analog data is read at port 19H. Digital-analog conversion at ports 1B and 1A is used to display the trapped waveform on a standard cathode-ray oscilloscope. In the Basic calling program (Listing 3), a manual pushbutton input to port 28 decimal is used to select waveforms to be saved or discarded. The range of the A/D input is −2.5 volts to 2.5 volts, with 0.02 volt resolution. Negative voltages are represented in 2s complement form: 127 decimal (FFH) is −0.02 volts. Different conventions for A/D conversion may require slight changes in the program and port assignments are likely to vary as well.

Calling from Basic

The trap routine can also be called from Basic. In Listing 3, the parameters are set in Basic and passed to the machine-language program through the stack. On return, the buffer pointer is saved and used to transfer the waveform to a disk file in the form of a 256-byte string.

Input 28, a manually-controlled voltage, allows the viewer to decide whether to save the trapped waveform. Once saved, it can be plotted for permanent record.■

```
SEGMENT OF BASIC PROGRAM CALLING TRAP AS USR

100 INPUT "SWEEP RATE, MSEC/CM =",W
110 GOSUB 1000: REM CONVERTS W TO WAIT COUNT W9
120 INPUT "THRESHOLD =",K
130 V=K+256*W9
140 D=USR(%FB00%,V)
150 Z=INP(28)
160 IF Z>128 THEN PRINT"NOT SAVED":GOTO 140
170 FOR I=0 TO 255
180 J=D+I:IF J>255 THEN J=J-256
190 P=PEEK(%FA00%+J)
200 S$(I,I)=CHR$(P)
210 NEXT I
220 PRINT\1,R\S$
230 PRINT "SAVED ON RECORD ";R
240 R=R+1
250 GOTO 140
```

Listing 3. Example of a calling program for the trap routine. The call is at line 140. Various Basics have different rules for calling machine-language programs; this is Cromemco Basic. The call is to address FB00 hex, and the 16-bit number V is passed to the stack, where it is retrieved by POP BC (Listing 2). This actually contains two numbers, combined at line 130 and used by registers B and C separately. The relation between the desired sweep rate and the wait count is machine-dependent. This is calculated in Basic subroutine 1000 (not shown). The letter D is the contents of the DE register on return from the machine-language program. This points to the location on the ring buffer at which the event was detected and is used at line 180 to read the buffer contents to a file (line 220). The string S$ has a length of 256 characters (eight-bit numbers). This is the most compact way to store a waveform in a disk file.

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If you find life intolerable with a line-oriented editor, this full-screen editor will fill your needs—until a faster, more complete product appears on the market.

by D.E. Cortesi

The most important piece of software in any computer system, for me, is its editor.

The editor is used for just about everything: source programs, memos, business letters, batch command files, articles, data files. . . Everything that goes onto a disk gets there through the editor program, or descends from something that did.

When I was loaned an IBM Personal computer, I found that it lacked an editor. It has Edlin, but I don't find that program to be an acceptable tool. I've been using full-screen editors for some years now, so I find it difficult to go back to a line-oriented editor—especially one as rudimentary as Edlin.

So there the machine sat, waiting for me to give it something to do. But what I needed was some kind of stop-gap—an editor I could tolerate until a professional product becomes available.

My solution was to write a stopgap editor in Basic.

The resulting program is interesting in several ways. It's an example of how much you can accomplish in IBM's Basic, and of how you can use the Basic language in a structured style of programming. And it's a scale model of a real full-screen editor, so it can serve as a test bed for ideas you might have on how an editor should work.

Program Objectives

The Stopgap Editor was an unusual programming project. It was the first time I'd written a program with the intention of using it heavily for a short time and then throwing it away.

The first requirement was that it had to go together quickly; that dictated a clean, simple design using straightforward techniques. The second requirement was that it have adequate function from the outset, because I was determined that there would be no second version of the program.

The program's speed of response would not be important, although it did have to accept input at my normal typing rate. It wouldn't need to handle large files; by the time I needed to edit large files, there would be a good editor on the market.

> I needed an editor
> I could tolerate until
> a professional product
> becomes available.

With these factors in mind, I sketched the parameters of the program. It would keep a file of a couple of hundred lines in storage as an array of strings. Lines would be no longer than the screen was wide. In fact, for simplicity of coding, no line would be shorter than the screen width, either.

It would present the file on the screen 24 lines at a time. The user would be able to move the cursor to insert, delete or type over characters. The special keypad functions of the PC keyboard would be supported to move the cursor over the screen and the screen over the file. There would be control-key signals to delete and insert lines and to move to the head and foot of the file.

The only disk I/O that would be required would be the ability to save the working file on disk and to load another file from disk. Since there would never be a great amount of data at risk, error-checking and reporting would be minimal.

These were the objectives; let's look at the program that resulted.

Using Stopgap

The Stopgap Editor is loaded and executed like any other program in Basic. Shortly after starting, it presents you with a clear screen.

The screen now becomes the electronic equivalent of a roll of paper. Each screen line corresponds to a line of characters in a disk file. Move the cursor around it with the up-, down-, left- and right-arrow keys and type anywhere you like.

The enter key moves the cursor to the left margin and down one line—without putting any data in the file. The tab key moves the cursor to the next tab stop to the right; it doesn't put any data in the file either.

The end key moves the cursor to the right side of the screen. The home key does one of three things, depending on where the cursor is when you press it. If the cursor is away from the

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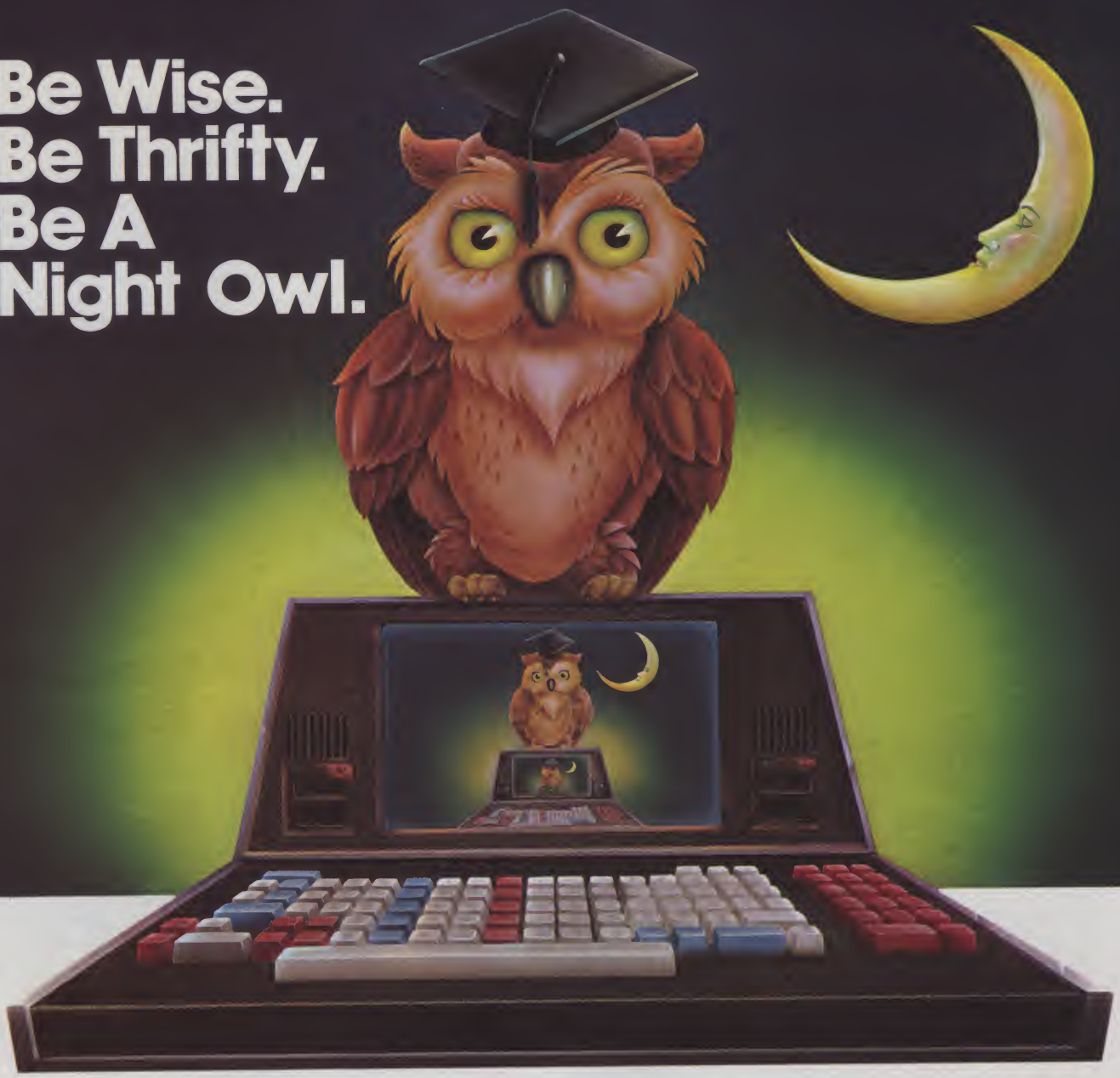

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left margin, the home key moves it back to the left margin. If the cursor is at the left margin but not on the top line, then the home key moves it to the top line. If the cursor is in the top left corner, the home key moves it to the bottom left corner. With just a few presses of the home and end keys, you can move to any corner of the screen. (I took this idea from the Magic Wand editor for CP/M.)

Type some characters on the screen. Move the cursor into the middle of a word and press the insert key. The cursor becomes double, framing the current character. (On the top line of the screen, the upper half of the cursor is invisible.)

Now, each character you type will be inserted ahead of the current character. If the line is full, one character will be lost from the right end for each one inserted. Pressing any key except a printable character will end insert mode.

You'll find that the backspace key erases the current character and moves the cursor to the left. Press the delete key and the current character disappears while the rest of the line shifts left to fill in and the cursor stays in place.

If you keep inserting or deleting for about 50 characters, the screen seems to go dead. After a pause of about ten seconds, though, the system comes to life again. This is a peculiarity of all Microsoft Basic interpreters.

The program has been doing several operations on character strings for every inserted or deleted character, and the Basic interpreter has filled up its working storage with garbage character strings. It stops to tidy up—and when Basic stops, everything stops. When spring cleaning is over, work resumes.

Paging Through the File

On every line of your file, type a few characters and hit the enter key. When you reach the bottom of the screen, keep going. The topmost lines scroll out of sight.

Keep on typing for a while, then press the "PgUp" key on the keypad. The editor moves back 23 lines, or to the top of the file. Note that the cursor stays where it was on the screen. Press the "PgDn" key; the editor moves forward 23 lines, or to the bottom of the file if that comes first.

Now try pressing "Ctrl" and "A" together. That makes the editor move the screen back to the top line of the file. Pressing "Ctrl" and "Z" causes it to move to the last line used. This is how you move about in a larger file. Use control-A to get to the top of the file and then use the page-down key, or use control-Z to move to the end and then page up.

Go to the end of the file with control-Z, then move the cursor to the top of the screen with the home key. Now press the up-arrow key. The editor slides the screen up the file 23 lines and moves the cursor down 23 lines, so that it is still on the line you were looking at.

Line Insertion and Deletion

Hitting control-D causes the editor to delete the entire line on which the cursor rests. It redraws the whole screen afterward, so deletion is a fairly slow process.

Inserting lines is a bit faster. When you press control-O, the editor splits the file just above the line the cursor is on. The lower part of the file is set aside. The line above the cursor becomes, temporarily, the bottom of the file; the screen is blank beyond it. Each blank line that you type on becomes part of the file at that point.

When the file is open, you can use all the other controls for insertion. You can page back into the upper part of the file to look at it; you can delete lines or insert characters. Control-Z will take you not to the real end of the file but to the line that was inserted last.

Once you have inserted as many lines as you want, press control-C. The editor splices the file back into a single piece, with the inserted lines embedded where you typed them. (This method of insertion is also copied from the Magic Wand editor.)

Commands

The Stopgap Editor supports just four commands. Press the "Esc" key. The editor clears the screen and displays a menu of the commands. Pressing the enter key will return you to the file display.

The save command asks for a filespec and copies the entire file to disk under that name. (If you give it a filespec of "LPT1:", it will copy the file to the printer!) The editor deletes trailing blanks from each line it saves and discards empty lines at the end of the file.

The load command asks for a filespec and loads the lines of that file into storage for editing. It truncates long lines to the width of the screen (but it doesn't tell you it has done so). The clear command wipes out everything, giving you a blank scroll to work on. The quit command returns you to the system. If you have added or changed anything in the file, these commands ask for confirmation before they act.

The Stopgap Editor's disk operations are painfully slow. It takes a couple of minutes to load or save a file of a hundred lines. If there is any sort of file error—if the disk fills up during a save, for example—you'll get an error message from Basic.

Your work hasn't been lost, though. Kill another file to get some space, then enter the command GOTO 1630. You should be back in the editor with your data intact. But remember, this editor is *only* a stopgap. Save your work often.

Reading the Program

If you're familiar with Basic, you should find the Stopgap program fairly readable. It is highly-structured, consisting mostly of small subroutines, each with a single purpose. However, the logic will not be clear until you understand the method of

Program Listing. Stopgap editor for IBM microcomputer.

```
100 '*************** THE STOPGAP EDITOR IN IBM BASIC ******************
110 '          ***** by D.E. Cortesi
120 DEFINT A-Z : MAXL = 300 : MAXW = 79 :' MAXW=40 FOR COLOR TV
130 GOTO 1490
140 ' ::: right-arrow key: move cursor right
150 IF SCOL=MAXW THEN RETURN
160 SCOL=SCOL+1 : INSCHAR=FALSE : LOCATE SROW,SCOL,1,CSL : RETURN
170 ' ::: left-arrow key: move cursor left
180 IF SCOL=1 THEN RETURN
190 SCOL=SCOL-1 : INSCHAR=FALSE : LOCATE SROW,SCOL,1,CSL : RETURN
200 ' ::: tab key: jump right from one to eight columns
210 S=((SCOL+8) AND (-8))+1 : IF S<=MAXW THEN SCOL=S
220 INSCHAR=FALSE : LOCATE SROW,SCOL,1,CSL : RETURN
230 ' ::: end key: go to right end of the current line
240 SCOL=MAXW : INSCHAR=FALSE : LOCATE SROW,SCOL,1,CSL : RETURN
250 ' ::: printable character, action depends on INSCHAR
260 IF NOT LMOD THEN L$=LT$(LCUR) : LMOD=TRUE
270 IF NOT INSCHAR THEN MID$(L$,SCOL,1)=CIN$ : GOTO 300
280 CIN$=CIN$+MID$(L$,SCOL,MAXW-SCOL)
290 L$=LEFT$(L$,SCOL-1)+CIN$
300 PRINT CIN$; : IF SCOL<MAXW THEN SCOL=SCOL+1
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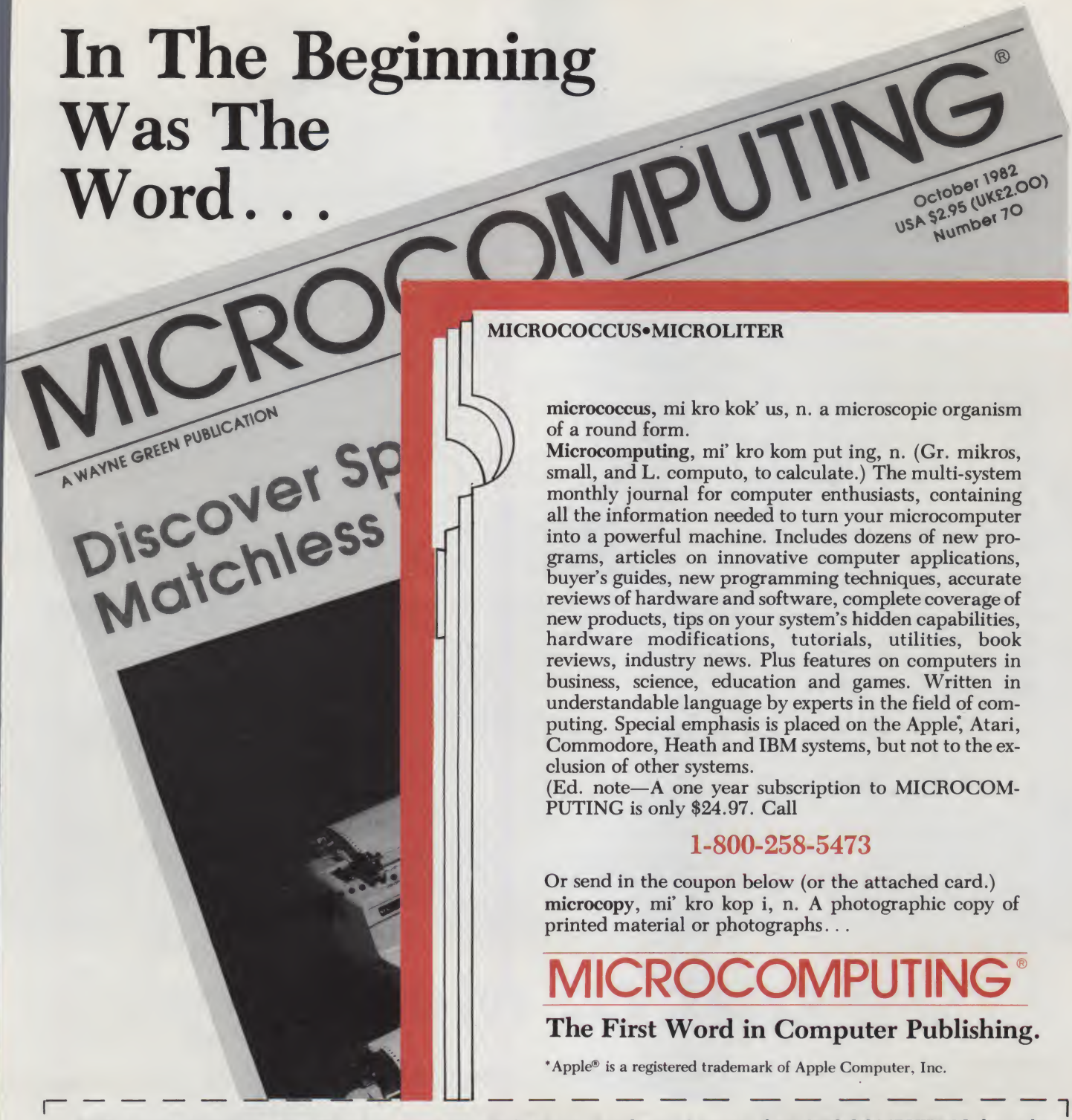

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Listing continued.

```
310 LOCATE SROW,SCOL,1 : RETURN
320 ' ::: backspace: blank current character, move left
330 IF NOT LMOD THEN L$=LT$(LCUR) : LMOD=TRUE
340 MID$(L$,SCOL,1)=" " : PRINT " ";
350 IF SCOL>1 THEN SCOL=SCOL-1
360 INSCHAR=FALSE : LOCATE SROW,SCOL,1,CSL : RETURN
370 ' ::: del key: kill current char, pull rest left
380 IF NOT LMOD THEN L$=LT$(LCUR) : LMOD=TRUE
390 CIN$=RIGHT$(L$,MAXW-SCOL)+" " : PRINT CIN$;
400 L$=LEFT$(L$,SCOL-1)+CIN$
410 INSCHAR=FALSE : LOCATE SROW,SCOL,1,CSL : RETURN
420 ' ::: if current line has changed, update the file
430 INSCHAR=FALSE : LOCATE ,,1,CSL : IF NOT LMOD THEN RETURN
440 FMOD=LMOD : LT$(LCUR)=L$ : LMOD=FALSE : RETURN
450 ' ::: return the index of the next free line in L
460 IF LFREE=0 THEN L=FALSE : RETURN :'NO FREE LINES LEFT
470 L=LFREE : LFREE=LF(L) : LF(L)=0 : LT$(L)=LMT$ : RETURN
480 ' ::: free the line whose index is in L
490 LF(L)=LFREE : LFREE=L : LT$(L)="" : RETURN
500 ' ::: forward one line in the file image
510 GOSUB 430 : L=LF(LCUR) :' L=0 IF LCUR IS BOTTOM LINE
520 IF L=0 THEN GOSUB 460 : IF L THEN LF(LCUR)=L : LB(L)=LCUR
530 IF L THEN LCUR=L :' FALSE IF BOTTOM AND NO FREE LINES
540 RETURN
550 ' ::: backward one line in the file image
560 GOSUB 430 : L=LB(LCUR)
570 IF L THEN LCUR=L :' FALSE IF TOP LINE
580 RETURN
590 ' ::: enter key: cursor to left margin, then down
600 SCOL=1
610 ' ::: down-arrow: cursor down (data up, on line 24)
620 Q=LCUR : GOSUB 510 : IF Q=LCUR THEN RETURN
630 SROW=SROW+1 : IF SROW<25 THEN LOCATE SROW,SCOL,1 : RETURN
640 SROW=24 : PRINT :' FORCE BLANK LINE, RETURN CURSOR
650 PRINT LT$(LCUR); : LOCATE SROW,SCOL,1 : RETURN
660 ' ::: up-arrow: cursor up (data down 23 lines, on line 1)
670 IF SROW=1 THEN 710
680 Q=LCUR : GOSUB 560 : IF Q=LCUR THEN RETURN
690 SROW=SROW-1 : LOCATE SROW,SCOL,1 : RETURN
700 ' ::: up-arrow on line 1: slide current line down 23
710 GOSUB 960 : S=0
720 WHILE (S<22) AND LB(T) : T=LB(T) : B=LB(B) : S=S+1 : WEND
730 SROW=SROW+S : GOTO 1020
740 ' ::: PgUp key: back up 23 lines, hold cursor still
750 GOSUB 430 : GOSUB 960 : S=0
760 WHILE (S<23) AND LB(T) : GOSUB 560 : T=LB(T) : B=LB(B) : S=S+1 : WEND
770 GOTO 1020
780 ' ::: PgDn key: ahead 23 lines, hold cursor still
790 GOSUB 430 : GOSUB 960 : S=0
800 WHILE (S<23) AND LF(B) : GOSUB 510 : T=LF(T) : B=LF(B) : S=S+1 : WEND
810 GOTO 1020
820 ' ::: Home key: go to left, then to top, then to bottom
830 IF SCOL>1 THEN SCOL=1 : INSCHAR=FALSE : LOCATE SROW,SCOL,1,CSL : RETURN
840 GOSUB 430 : GOSUB 960 : S=SROW
850 IF SROW=1 THEN WHILE LCUR<>B : GOSUB 510 : S=S+1 : WEND
860 IF SROW>1 THEN WHILE LCUR<>T : GOSUB 560 : S=S-1 : WEND
870 SROW=S : LOCATE SROW,SCOL,1 : RETURN
880 ' ::: control-a: go to top of the file
890 GOSUB 430 : GOSUB 2240 : LCUR=A
900 SROW=1 : SCOL=1 : GOSUB 960 : GOTO 1020
910 ' ::: control-z: go to the end of the file
920 GOSUB 430 : GOSUB 2240 : LCUR=Z : T=Z : B=Z : S=1
930 WHILE LB(T) AND S<24 : T=LB(T) : S=S+1 : WEND
940 SROW=S : SCOL=1 : GOTO 1020
950 ' ::: find the lines now at the top(T) and bottom(B) of the screen
960 S=SROW : T=LCUR
970 WHILE (S>1) AND LB(T) : S=S-1 : T=LB(T) : WEND
980 S=SROW : B=LCUR
990 WHILE (S<24) AND LF(B) : S=S+1 : B=LF(B) : WEND
1000 RETURN
1010 ' ::: redraw the screen using lines from T to B
1020 CLS : L=T
1030 WHILE L<>B : PRINT LT$(L) : L=LF(L) : WEND
1040 PRINT LT$(B);
1050 LOCATE SROW,SCOL,1 : RETURN
1060 ' ::: Ins key: toggle insert-character mode
1070 INSCHAR=NOT INSCHAR
1080 IF INSCHAR THEN LOCATE ,,1,CSL,1 ELSE LOCATE ,,1,CSL
1090 RETURN
1100 ' ::: control-o: split the file for bulk insertion
1110 IF INSLINE OR LF(LCUR)=0 OR LFREE=0 THEN RETURN
1120 GOSUB 430 : LINS=LCUR : LCUR=LB(LCUR)
1130 IF LCUR THEN LF(LCUR)=0 : GOSUB 510
1140 IF LCUR=0 THEN GOSUB 460 : LB(L)=0 : LCUR=L
1150 INSLINE=TRUE : GOSUB 960 : GOTO 1020
1160 ' ::: control-c: splice the file after bulk insert
1170 IF NOT INSLINE THEN RETURN
1180 GOSUB 430 : WHILE LF(LCUR) : LCUR=LF(LCUR) : WEND
1190 LF(LCUR)=LINS : LB(LINS)=LCUR
1200 IF LT$(LCUR)<>LMT$ THEN 1240
1210 L=LCUR : LCUR=LF(LCUR) : LB(LCUR)=LB(L)
1220 IF LB(L) THEN LF(LB(L))=LCUR
1230 GOSUB 490
1240 INSLINE=FALSE : GOSUB 960 : GOTO 1020
1250 ' ::: control-d: delete the current line
1260 IF LF(LCUR)+LB(LCUR)=0 THEN RETURN :'CAN'T DELETE ONLY LINE
1270 IF LB(LCUR) THEN LF(LB(LCUR))=LF(LCUR)
1280 IF LF(LCUR) THEN LB(LF(LCUR))=LB(LCUR)
1290 L=LCUR : IF LF(L)>0 THEN LCUR=LF(L)
1300 IF LF(L)=0 THEN LCUR=LB(L) : IF SROW>0 THEN SROW=SROW-1
```

More

data storage.

The lines to be edited are stored in an array of strings called LT$ (for "line text"). The size of the array is established by the value of MAXL. Initially, the array contains MAXL number of empty strings. The maximum size of any element of LT$ is set by the value of MAXW. That must be a number that is less than the width of the screen—80 for the monochrome display, 40 for a color monitor.

Whenever a string (a line) is updated in any way, it is forced to be MAXW bytes long. It will stay that way unless it is deleted, in which case it is made empty again.

Initially, lines are put into the LT$ array in their natural order, so that the first line of the file is in LT$(1), the second in LT$(2) and so on. However, lines may be inserted and deleted. It would take an intolerably long time for the program to shift lines up or down in LT$ to account for insertions and deletions.

Once a line has been put in an element of LT$, it stays in that element regardless of what happens to other lines. Eventually, the order of lines in LT$ will not be the same as the logical order of lines in the file.

The true order of the file is retained in a double chain of indexes to LT$, which is kept in the integer arrays LF and LB. For any line LT$(J), the line that follows it in the file is the line in LT$(LF(J)), and the line that precedes it is the line in LT$(LB(J)). I think of those expressions as saying "LT$(the line following (J))" and "LT$(the line before(J))."

The LF and LB arrays are used throughout the program to trace backward and forward through the file in its logical order. When LF(J) = 0, line J is the bottom line of the file. When LB(J) = 0, line J is the top line of the file.

The current line—the one the cursor is resting on—is the line in LT$(LCUR). If the user has made no change in that line, the variable LMOD contains the value False (0).

As soon as the user tries to change the current line, it is copied to the string variable L$ and LMOD is set to True (non-zero) to show that the line has been modified. All changes take place in L$—it's generally quicker to do string operations on a scalar variable than to do them on one element of an array.

As soon as the user indicates a desire to move to another line, the pro-

Listing continued.

```
1310 GOSUB 490 : GOSUB 960 : GOTO 1020
1320 ' ************* THE MAIN LOOP *********************************
1330 CIN$=INKEY$ : ON 1+LEN(CIN$) GOTO 1330,1390,1350
1340 'handle a special key (numeric pad, Ins, Del)
1350 S=ASC(RIGHT$(CIN$,1)) : IF S<71 OR S>83 THEN 1330
1360 ON S-70 GOSUB 830,670,750,1330,180,1330,150,1330,240,620,790,1070,380
1370 GOTO 1330
1380 'handle regular control or character key
1390 S=ASC(CIN$) : IF S>31 THEN GOSUB 260 : GOTO 1330
1400 IF S=>8 AND S<=13 THEN ON S-7 GOSUB 330,210,620,830,1330,600 : GOTO 1330
1410 IF S=1 THEN GOSUB 890 : GOTO 1330
1420 IF S=3 THEN GOSUB 1170 : GOTO 1330
1430 IF S=4 THEN GOSUB 1260 : GOTO 1330
1440 IF S=15 THEN GOSUB 1110 : GOTO 1330
1450 IF S=26 THEN GOSUB 920 : GOTO 1330
1460 IF S=27 THEN GOSUB 1630 : GOTO 1330
1470 GOTO 1330
1480 ' ************* INITIALIZATION *********************************
1490 GOSUB 1520 : FSPEC$="" :' CLEAR ALL DATA AND SET UP
1500 CLS : LOCATE SROW,SCOL,1 : GOTO 1330
1510 ' ::: clear all variables, set up a null data array
1520 DIM LF(MAXL),LB(MAXL),LT$(MAXL)
1530 LMT$=SPACE$(MAXW)
1540 FALSE=(1=2) : TRUE=NOT FALSE
1550 LMOD=FALSE : FMOD=FALSE
1560 CSL=12 :' CURSOR SCAN LINE -- MAKE 7 FOR COLOR TV
1570 INSCHAR=FALSE : LOCATE ,,1,CSL : INSLINE=FALSE
1580 FOR I=2 TO MAXL-1 : LF(I)=I+1 : NEXT I : LF(MAXL)=0 : LFREE=2
1590 LCUR=1 : LF(LCUR)=0 : LB(LCUR) = 0 : LT$(LCUR)=LMT$
1600 SROW=1 : SCOL=1 : LCUR=1 : T=1 : B = 1
1610 RETURN
1620 ' ************* GLOBAL COMMANDS *********************************
1630 GOSUB 1170 : GOSUB 430 : GOSUB 960
1640 CLS : LOCATE 10,1
1650 PRINT "Command choices are..." : PRINT
1660 PRINT "    1. SAVE the present file"
1670 PRINT "    2. LOAD another file"
1680 PRINT "    3. CLEAR the data buffer of all data"
1690 PRINT "    4. QUIT and return to DOS."
1700 PRINT
1710 INPUT "Your choice of 1,2,3,4 ";CIN$
1720 IF CIN$="" THEN GOSUB 1020 : GOTO 1330
1730 CIN$=LEFT$(CIN$,1)
1740 IF CIN$="1" THEN GOSUB 1800 : GOTO 1640
1750 IF CIN$="2" THEN GOSUB 1930 : GOTO 1640
1760 IF CIN$="3" THEN GOSUB 2070 : GOTO 1640
1770 IF CIN$="4" THEN GOSUB 2100 : GOTO 1640
1780 GOTO 1640
1790 ' ::: the command is: SAVE
1800 GOSUB 2180 : OPEN FSPEC$ FOR OUTPUT AS #1
1810 GOSUB 2240 :'find the top and bottom of the data
1820 'write all lines, deleting trailing blanks
1830 WHILE A<>Z
1840   L$=LT$(A)
1850   I=MAXW
1860   WHILE I>1 AND MID$(L$,I,1)=" " : I=I-1 : WEND
1870   L$=LEFT$(L$,I)
1880   PRINT#1,L$
1890   A=LF(A)
1900 WEND
1910 CLOSE#1 : FMOD=FALSE : RETURN
1920 ' ::: the command is: LOAD
1930 GOSUB 2070 : IF NOT Q THEN RETURN
1940 GOSUB 2180 : OPEN FSPEC$ FOR INPUT AS #1
1950 'read up to MAXL lines, force all to MAXW bytes
1960 WHILE (LFREE>0) AND NOT(EOF(1))
1970   LINE INPUT#1,CIN$
1980   L$=LMT$ : LSET L$ = LEFT$(CIN$,MAXW)
1990   LMOD=TRUE
2000   GOSUB 510
2010 WEND
2020 CLOSE#1
2030 LMOD=FALSE : FMOD=FALSE
2040 LCUR=1 : SROW=1 : SCOL=1 : GOSUB 960
2050 RETURN
2060 ' ::: the command is: CLEAR (or clear prior to LOAD)
2070 GOSUB 2120 : IF NOT Q THEN RETURN
2080 ERASE LT$,LF,LB : GOSUB 1520 : RETURN
2090 ' ::: the command is: QUIT
2100 GOSUB 2120 : IF Q THEN SYSTEM ELSE RETURN
2110 ' ::: if the file has been changed, get confirmation
2120 IF NOT FMOD THEN Q=TRUE : RETURN
2130 PRINT : PRINT "The file has been MODIFIED...!"
2140 INPUT "...are you SURE you want to do this (Y/N) ";CIN$
2150 CIN$=LEFT$(CIN$,1)
2160 Q=(CIN$="y") OR (CIN$="Y") : RETURN
2170 ' ::: get a filespec for load or save
2180 PRINT : PRINT "Give me a filespec";
2190 IF FSPEC$<>"" THEN PRINT " (";FSPEC$;")";
2200 INPUT CIN$ : IF (CIN$+FSPEC$)="" THEN PRINT : GOTO 2180
2210 IF CIN$<>"" THEN FSPEC$=CIN$
2220 RETURN
2230 ' ::: find the top(A) and bottom(Z) lines of data
2240 A=LCUR : WHILE LB(A) : A=LB(A) : WEND
2250 Z=LCUR : WHILE LF(Z) : Z=LF(Z) : WEND
2260 '..minus trailing, empty lines, if any
2270 WHILE LT$(Z)="" AND Z<>A : Z=LB(Z) : WEND
2280 RETURN
```

gram tests LMOD. If the line has been changed, it is copied back to its place in LT$, and FMOD is set True so that the command routines will know that the file has been modified.

The LT$ array is kept compact; elements of it are allocated as needed, much in the way that DOS allocates disk sectors. The next available element is the one at LT$(LFREE), and LF(LFREE) is the head of a chain of free elements. This chain is only a single one; it can be traced forward via LF, but not backward through LB.

A line is allocated by pulling the chain up one link; if that makes LFREE=0 then all the lines are in use. A line is allocated whenever the user moves the cursor down past the current end of the file. Lines are freed only by deletion.

The position of the cursor is kept in the variables SROW and SCOL. Since text lines and screen lines correspond exactly, SCOL is also the index of the current character in LT$(LCUR).

The effects of different control keys on SROW and on LCUR have been carefully calculated. When the up- and down-arrow keys are used, the two move together. When the page-up and page-down keys are used, SROW (and hence the cursor) stands still while LCUR moves a page in the file. When the control-A and control-Z signals occur, both of them move. LCUR goes to the top or bottom of the file, and SROW goes to the top or bottom of the screen.

The Stopgap Editor was quite a simple program until I added character insertion to it. I wanted to change the shape of the cursor to indicate that character insertion was active. That is done with the Locate command.

The operands of Locate depend on the type of monitor in use—the bottom cursor scan line is 12 for a monochrome display and seven for a color monitor. I put the scan line number in the variable CSL so that a user could alter the program.

Every single routine that moves the cursor has to kill insert mode if it is on, and that means returning the cursor to its usual appearance as well as setting the INSCHAR flag to False. That's why there are so many occurrences of "INSCHAR=FALSE : LOCATE SROW,SCOL,1,CSL."

The Stopgap editor is currently in service, doing what I meant it to do: it's taking the place of a real editor until one becomes available. Like any effective stopgap, it isn't much, but it's enough.■

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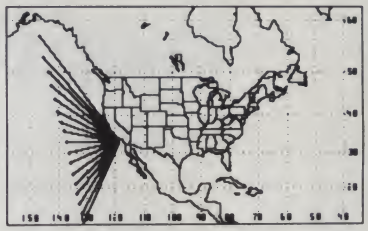

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Reach into Atari's Bag of Tricks

Use the Atari's graphics mode to create multiple video displays —you can even create animated displays!

By Nitchka

After having written a Turing Machine simulation that completely filled the screen, I was looking for more display area. I wanted to include a graph to show a different view of what the simulation was doing.

There was an 18-tree forest in the upper half of the screen and a "Busy Beaver" who ran amok there as he dutifully and noisily carried out the instructions written on the lower half of the screen. The problem would be solved if the Atari could provide a second page of screen display.

A second page would mean the graph could be looked at whenever the program user desired to do so. The rest of the time, the "Busy Beaver," his forest and his instructions would be displayed.

The Atari does offer paging. In graphic mode 0, every K of free memory can be converted into another page of display.

Now the "Busy Beaver" Turing Machine simulation has a graph, and now you can add extra graphs, tables or other data displays to your programs. Each item can have its own page, can be kept updated as the program progresses and can be called to the screen at will.

And consider the awesome power of multi-paging as applied to animation. By redefining the Atari character set into high resolution components of the images to be animated, you could stay in a text mode. The resolution of the animation would be high, but the memory requirement would remain low. Mix in some objects made from Atari's player-missile graphics, and what appears on the screen should be wondrous to behold.

```
200 REM          INITIALIZING
210 PRINT")"
220 TOPOFMEM=PEEK(741)+PEEK(742)*256
230 DLIST=PEEK(560)+PEEK(561)*256
240 PAGE1=PEEK(DLIST+4)+PEEK(DLIST+5)*256
250 PRINT ,TOPOFMEM,DLIST,PAGE1
260 PAGE2=PAGE1-1024:PRINT ,,,PAGE2
270 PAGE3=PAGE2-1024:PRINT ,,,PAGE3
280 PAGE4=PAGE3-1024:PRINT ,,,PAGE4
300 REM     PRINTING
310 FOR I=1 TO 22
320 POKE PAGE1+40*12+I,32+I
330 POKE PAGE2+40*I+I,32+I
340 POKE PAGE3+40*I+12,32+I
350 POKE PAGE4+40*(23-I)+I+1,55-I
360 NEXT I
400 REM       FLIPPING
410 IF PEEK(53279)=3 THEN 510
420 IF PEEK(53279)=5 THEN 610
430 GOTO 410
500 REM       LOWER PAGE
510 POKE DLIST+5,PEEK(DLIST+5)-4
520 FOR  TIME=0 TO 11:NEXT TIME
530 POSITION 0,18
540 PRINT ,,"I'M HERE"
550 GOTO 410
600 REM    HIGHER PAGE
610 POKE DLIST+5,PEEK(DLIST+5)+4
620 FOR TIME=0 TO 11:NEXT TIME
630 POSITION 0,20
640 PRINT ,,"I'M STILL HERE"
650 GOTO410
```

Listing 1. Max Paging example program for the Atari.

Example Programs

The two example programs use the normal display memory (PAGE1) and three program-created display memories. On each of these four pages is a line of letters (A through V).

PAGE1's line is horizontal, PAGE2's goes diagonally from upper left to lower right, PAGE3's is vertical and PAGE4's is diagonal from upper right to lower left. They're not stunning displays of computer art, but they're enough to demonstrate that you are dealing with four distinct pages.

PAGE1 includes other information which will help you understand what the program is and isn't doing. One thing it is *not* doing is printing anywhere but on PAGE1.

The other pages must be "printed" and "erased" by using pokes. The values to be poked are based upon the internal character set code listed on

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page 55 of the "Basic Reference Manual."

Max Paging (Listing 1) allows you to look at the four pages already mentioned, plus almost every other block of RAM or ROM in the Atari. The view you'll get makes it seem as if the machine instruction code in ROM were code for characters.

By pressing the Option key, you'll be looking at lower locations; by pushing Select, the locations you view will be higher. If you want to terminate the program, return to PAGE1 before hitting Break, or else use Reset.

Instant Paging (Listing 2) is the same as the first except for its range and method of page selection. Only the four pages with lines of letters can be called, but they can be displayed out of sequence. Use the keyboard buttons 1 through 4.

The Max Paging program demonstrates how you can flip through block after block of potentially usable pages, but Instant Paging has a method of page changing that is more predictable and, probably, more generally applicable.

An experienced programmer may go right to work on these programs. Those who are less familiar with the Atari might profit from the following explanations.

The key to the whole paging process is to find where the Atari has stored the address of the display memory so that you can change it. This address lies in the fifth and sixth locations of the display list (as well as in locations 88 and 89, but these don't have to be changed). So where is the display list? It begins at the address specified by locations 560 and 561.

You may already be aware that Atari reverses the order of the numbers in location pairs. For instance, with an Atari that has 40K of memory, the display list will begin at location 39968. Since 39968/256 equals 156 with 32 remaining, location 560 will contain 32 (the low order remainder) and 561 will have a value of 156 (the high order number).

By adding the number in location 560 to the value obtained by multiplying 256 times the number in 561, you will get the address (DLIST) at which the Atari is storing its display list. DLIST represents the first location in the display list; DLIST plus four and DLIST plus five contain the address of the display memory (PAGE1).

To change what is displayed on the screen, you poke a new address (PAGE2, for instance) into these two locations of the display list. But since PAGE2 is exactly 1K (1024) locations below PAGE1, only the high order number needs to be changed. Subtracting four from the high order location tells the Atari to go 1024 (4×256) locations lower to read the display memory.

Calculating the size of the display memory is simple, but it varies with the graphic mode you're using. Text modes take little memory, while the higher level graphic modes devour memory at a ravenous rate.

After you have decided what mode to use, multiply its number of columns by its number of rows. To avoid overlapping, start your second page of display memory at least that many locations below the previous page.

The page flipping loop in Max Paging peeks into location 53279 to see whether the Option or Select key is being held down. The page select loop in Listing 2 peeks into location 764 to find which of the first four number buttons has been pressed.

The most difficult part of paging is probably the method of printing on the extra pages. The following formula will help you in putting a character where you want it:

PAGE + CPR × Row + Col

To the first location of the page you want to poke a character into, add the product of the number of columns per row (CPR) times the row you want the character to appear upon (first row is 0) and then add the number of the column.

Depending upon what graphic mode you are in, you may or may not get the character that corresponds to the internal character set code number you poked into the new page.

Graphic mode 0 offers 256 characters—the 128 listed on page 55 of the "Basic Reference Manual" plus their reverse video counterparts. Graphic modes 1 and 2 allow 64 characters in four different colors.

If you have questions I haven't answered, the programs themselves may make things clear. They make up a bare-bones demonstration of an impressive trick in the Atari repertoire.■

```
200 REM INITIALIZING
210 PRINT ")"
220 TOPOFMEM=PEEK(741)+PEEK(742)*256
230 DLIST=PEEK(560)+PEEK(561)*256
240 PAGE1=PEEK(DLIST+4)+PEEK(DLIST+5)*256
250 PRINT ,TOPOFMEM,DLIST,PAGE1
260 PAGE2=PAGE1-1024:PRINT ,,,PAGE2
270 PAGE3=PAGE2-1024:PRINT ,,,PAGE3
280 PAGE4=PAGE3-1024:PRINT ,,,PAGE4
300 REM    PRINTING
310 FOR I=1 TO 22
320 POKE PAGE1+40*12+I,32+I
330 POKE PAGE2+40*I+I,32+I
340 POKE PAGE3+40*I+12,32+I
350 POKE PAGE4+40*(23-I)+I+1,55-I
360 NEXT I
400 REM      SELECT   INIT
410 POKING1=PEEK(DLIST+5)
420 POKING2=PEEK(DLIST+5)-4
430 POKING3=PEEK(DLIST+5)-8
440 POKING4=PEEK(DLIST+5)-12
450 REM
460 P1=610
470 P2=620
480 P3=630
490 P4=640
500 REM      PAGE  SELECT
510 PAGE=PEEK(764)
520 IF PAGE=31 THEN GOTO P1
530 IF PAGE=30 THEN GOTO P2
540 IF PAGE=26 THEN GOTO P3
550 IF PAGE=24 THEN GOTO P4
560 GOTO 510
600 REM        PAGE  CHANGE
610 POKE DLIST+5,POKING1:GOTO 510
620 POKE DLIST+5,POKING2:GOTO 510
630 POKE DLIST+5,POKING3:GOTO 510
640 POKE DLIST+5,POKING4:GOTO 510
650 GOTO 510
```

Listing 2. Instant Paging example program.

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The Many Faces Of the TI 99/4A

With plenty of room for plug-in peripherals, Texas Instruments' 99/4A is ideal for the novice who plans to grow with his computer.

By Michael Kilian

Texas Instruments' TI 99/4A, with its advanced peripherals (including a speech synthesizer and 16-color graphics) and ease of use, is ideal for the novice who is not interested in the computer's internal workings but wants to get into computing rapidly.

From the Outside . . .

Encasing the TI 99/4A is a brushed-aluminum console with black plastic trim. Within the console are the main processor, 16K of memory, some ROM software and a color video display processor. The keyboard is part of the console, and next to the keyboard is the solid state software slot. Plastic cartridges providing statistical programs, programming languages and games can be inserted here.

One of the major improvements of the 99/4A over the 99/4 is the keyboard. It has 48 keys and upper- and lowercase letters. To ensure that all possible keycodes are present, an additional control key has been added; this function key allows some keys to generate as many as four codes. For example, the P key can represent upper- and lowercase P, control-P and function-P, which produces a '' (quote).

If you are accustomed to an oversized return key, you'll have to restrain yourself a bit when using this keyboard. The only oversized keys are the right shift key and the space bar. The left shift key, which is diagonally above the control key, is particularly ill-placed.

TI peripherals plug directly into the side of the console, and each peripheral has a slot in it for the next peripheral. In effect, each device extends the bus, to a maximum of four peripherals (five if the speech synthesizer is connected).

Devices that can be added to the system include a speech synthesizer, a disk controller (with triple disk capability), an RS-232 interface, a parallel interface and memory expansion. The speech synthesizer is set up with a canned vocabulary of approximately 400 words, but special software can take advantage of some of the other features of the synthesizer to give an almost unlimited vocabulary. The RS-232 interface has two ports. The memory expansion provides an additional 32K RAM.

TI recently came out with a peripheral expansion chassis. You can put peripheral cards in a single motherboard and use a single power supply. Each card is encased in a metal sleeve which is inserted into one of the slots in the expansion box. One power switch enables all of the peripherals (including one disk drive within the chassis).

Address Space	Purpose	VDP RAM*	GROM
0000-1FFF	ROM, Basic Monitor, GROM	0000-02FF screen 0300-037F sprite 0380-039F color 0400- more sprite 0800-1000 patterns	48 K worth of GROM. GROMs come in increments of 6K and are located on 8K boundaries.
2000-3FFF	8K of expansion RAM	high-order: disk buffers, Basic storage —end of VDP—	
4000-5FFF	peripheral ROMS		
6000-7FFF	command module ROMS		
8000-	CRU RAM		
8300-83FF -9FFF	CPU RAM		
A000-FFFF	24K of expansion RAM		

*VDP address boundaries are variable within the 0000-3FFF address space.

Table 1. Memory map of the TI 99/4A system.

Address correspondence to Michael Kilian, 1869 Highland Ave., Troy, NY 12180.

The entire chassis is then connected to the 99/4A with a ribbon cable, allowing convenient positioning. I haven't had a chance to try this chassis, but it seems to be a major improvement over the extended bus.

And Inside . . .

At the heart of the system is TI's 9900 chip. The largest difference between this and other microcomputers' chips is that this is a 16-bit microprocessor.

And You . . .

How does the system present itself to the user? In other words, what is the software like?

Available programs include Extended Basic, Terminal Emulator, Disk Manager and several others. An assembler with a linking loader and Pascal are now becoming available. (I've previewed the assembler package and have found it to be useful. The symbolic linking loader is especially nice compared to the absolute loaders common in most micros.)

The software, including the monitor, is menu-driven. For example, all of the options available in the Disk Manager are prompted by a numbered list. Initially, a list of broad subcategories is presented (file commands, disk commands). After you choose one of these items, another list, which gives more specific options, is presented. This continues until the operation is complete.

While ideal for the novice user who doesn't want to memorize commands, it has drawbacks for the experienced user. The set of options is static; new commands cannot be added to the relatively small set available (there is no list-contents-of-file command, for example).

This inflexibility problem is most evident in the Terminal Emulator. With this "GROM" (GROMs are the solid state software components that plug into the console to provide Extended Basic or other available software), the TI 99/4A can act as a terminal and connect with other 99/4As or mainframes, including subscription services. It has many convenient characteristics, such as screen buffering and true text-to-speech capability.

However, some of the functions the Terminal Emulator could provide are unavailable to me. It has the potential to transfer files; unfortunately the mainframe I hook up with doesn't recognize the codes the TI uses. Therefore, this option is unavailable. My biggest complaint about the software is that it isn't dynamic enough to accommodate what could be a very dynamic system.

Encased in a brush-aluminum console with black plastic trim, the TI 99/4A features a 48-key keyboard and upper- and lowercase letters.

On the other hand, Extended Basic is not menu-driven. Of the software I have used, this is the most elaborate. TI has expanded upon every feature of standard Basic. Variable names may be up to 15 characters long. Logical conjunctions are available as well as the if-then-else construct. Probably the most significant development in the Basic is the introduction of named subroutines with parameters and local variables.

Named subroutines aid in programming and also let you add features to the system. Within the Basic is a set of canned routines that act almost as commands. These subroutines allow access to speech synthesis, music and moving graphics (sprites). To say hello on the speech synthesizer requires only a CALL SAY("HELLO"). The sprite routines

The TI 99/4A was the first home computer console to offer a 16-bit central processing unit. With the machine's language, TI Basic, 16 colors can be programmed for graphic effects; music and sound effects also can be generated.

VDP RAM	CPU RAM	
0000		
	8801	data read
	8C00-8C01	address to access* (XXXX)
XXXX YY		
	8C03	data to be written (YY)
3FFF		

*address's two high-order bits describe whether this is a read or a write function:
00—read
01—write.

Table 2. VDP RAM access (analogous for GROM access).

allow definition of patterns, setting the patterns in motion and checking where they are.

TI Extended Basic uses the Memory Expansion Unit, but the console Basic doesn't. Much larger programs can therefore be executed using Extended Basic. It uses the memory expansion that the CPU can directly access, so machine-language programs are also supported. With the new assembler, Basic will be able to call into machine code by symbol reference—no addresses will be needed by the Basic program. This makes more powerful software possible.

One of TI's latest software developments is TI Logo, a computer language that helps primary school age to high school age students develop problem-solving skills. Designed for use on the TI 99/4, TI Logo involves use of the keyboard to draw geometric figures and designs and to create multicolored shapes on the display screen. It's available from TI (PO Box 53, Lubbock, TX 79408) for $299.95.

There is a price to be paid for the Basic's flexibility: Execution speed is less than terrific. Table 3 contains time comparisons for a couple of Basics running a simple prime number generating program. (The comparison is not really fair since the TI Basic far outstrips the others in terms of features available. It's analogous to comparing the speed of the Queen Mary with a hydroplane.)

Another tradeoff is that speech generation is limited to about 400 words and phrases; different sets of words can be placed in the speech synthesizer, but it always has an upper limit. All in all, though, when speed of execution is not crucial, Extended Basic can meet almost any need.

A Brief Note on Documentation

The documentation for Extended Basic consists of a 230-page book with a description of all the commands and subroutines as well as example programs. Unfortunately, not all of the documentation meets these standards. Texas Instruments, in keeping with the idea that the TI 99/4A is a computer even a novice can easily use, has designed its manuals with a novice in mind—instructions cover how to plug in the machine. Little coverage is given to the more abstract features of the system, and internal characteristics are omitted.

One problem which could be ag-

gravated by poor documentation is a disk crash. There is no information in the manuals on how the disks are formatted. If a disk were to crash, you'd have no way (even with a disk editor) of knowing what was happening in the disk. Catalogs, sector maps and sector linkings are not even mentioned in the documentation. This is a fundamental flaw.

Summary

I've only scratched the surface of the TI 99/4A system, and I haven't even hinted at many of its features. The future of the micro is wide open. With the assembler will come more powerful operating systems and applications software. Pascal is a delightful addition (though I have not used TI's implementation).

Other additions which would be nice to see are Forth, a text-to-speech package for machine-language routines and a disk-oriented (as opposed to GROM-oriented) operating system. (For the TI to become truly dynamic, a disk-based operating system is a necessity.)

The TI has its strong points and its flaws. In a time of ever cheaper memory and systems approaching megabyte capability (68000, IBM. . .), the TI 99/4A with only 32K RAM (48K including VDP) seems particularly limited. The software is powerful, but not dynamic. It has been rumored that micros are heading toward the day when they won't be programmable except at the factory, so to speak. Maybe Texas Instruments is heading toward this goal faster than other companies. With the 99/4A geared so strongly toward the novice, this seems to be the case.

The idea of micros becoming as common as television sets may require that they be as simple as television sets to use. But then again, maybe not.★

Time comparisons for TSC BASIC (6809), TI Console Basic, TI Extended Basic and Atari Basic.

Benchmark Program:

```
100 FOR I=1 TO 100 STEP 2
110 FOR J=2 TO SQR(I)+1
120 IF I/J=INT(I/J) THEN 150
130 NEXT J
140 PRINT I;
150 NEXT I
160 END
```

The program calculates the primes between 1 and 100 (except 2). Ten times were taken with a stopwatch and averaged. Time intervals began when the return key was hit after RUN was typed and ended when 97 was displayed. The results are (times are in seconds):

Atari	TSC	TI Console	TI Extended	TI Latest Vs.
10.8	3.2	17.7	12.5	9.9

Note that TI BASICs carry calculations out to 14 significant digits and allow many more features than the others.

Table 3. Timing comparison of TI Basics.

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Flight Simulation

Take off for new Horizons with this Program for the ZX-81

I couldn't resist the temptation to order the Flight Simulation program from Sinclair's new series. I was not disappointed.

This excellent program, distributed through Sinclair Research and written by Psion Ltd. of England, is 90 percent Basic with several machine-code routines to handle some of the screen displays. The displays are superb and amazingly fast, considering that most of the program is in ZX Basic. It is a real bargain at $9.95.

The tape loads on the first try and asks if you want to fly the whole course or just make the final approach. The final approach aligns you perfectly with the runway two miles out; from there it's up to you and the keyboard.

The program has three separate display modes. One is a view from within the cockpit. There are separate indicators for such things as gear position, fuel, rate of climb, flap position, heading, speed and your position in relation to your logged-on beacon. The horizon is shown through the windows, but the runway is not seen in this mode.

The gauges are very realistic and are updated continuously. The automatic direction finder is a circle of dots with a small plane in the center. Your logged beacon is one of these dots and is flashing relative to its position to the heading of the plane. The flashing dot will move around the circle as you turn.

The second mode is the Map, which shows a 20-mile area in which you fly. This mode shows all beacons, the runway, a mountain chain and the flashing location of your aircraft. The map is helpful in determining where you are in relation to the runway. If you get off course, it is difficult to align yourself with the runway.

The last and probably the most amazing mode is the visual approach. This mode can be selected at any time, but will show the runway only if you are within two miles of it. The graphics here, understandably, are slightly crude, but the perspective angles and views are handled very realistically. The perspective is updated twice each second and the final approach is made with the first view being from two miles out and the last being the hash marks at the end of the runway. Landing safely is very difficult until you learn to use the glide slope indicator in the left part of the screen and the speed/altitude indicator to the right.

If you come in at too great an angle, you probably will crash due to a high bounce, but there are many other goofs which will also cause your early demise.

When a crash occurs, the screen will rapidly dissolve pixel by pixel as though it were disintegrating. A crash report is then issued as to why you crashed, how fast you were going and where it occurred. If you do land successfully, a landing rating is given as though an instructor was sitting next to you.

The only drawback to the program is that all flying, maneuvers, etc. are in real time. To fly the entire course could take as long as 20 minutes. It could take longer if you have to go around because of a bad approach.

Control is handled through the keyboard, with the arrow keys simulating the movement of the control stick. Various other keys are used to modify the other functions such as flaps, gear, power, etc. This would be a great program for joysticks.

My six-year-old loves to play this simulation and usually makes better landings than I do. Now when he sees a plane coming in at the local airport he says, "Yeah, he's got his gear down." *(Sinclair Research Ltd., 2 Sinclair Plaza, Nashua, NH 03061. $9.95)*

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Marauder

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Something called Marauder, that's what. The authors, Rorke Weigandt and Eric Hammond, have packaged a genuine thrill-a-second arcade game. But you'll not find this alien-invasion tourney at your local quarter-gulper. This is strictly Apple computer fare.

The player's restrictions are virtually nonexistent when participating in this attack upon an alien planet. Two differing phases of play may be combined to form a tough and formidable single game or each phase may be played separately... sort of like getting three games for the price of one. The player selects an appropriate skill level of from 0 to 9. The selections are made from the main menu, which appears after booting.

Level One consists of your preliminary attack upon the alien world. The planet does everything in its power to prevent your success. Indestructible fireballs, mines and missiles fly heavenward in repeated attempts at your utter annihilation. The only way to stop their assault is to destroy the specific turrets planetside by pounding them with bombs. However, there is the slight matter of a powerful force field protecting the alien emplacements. This field must be weakened before your explosive charges will find their targets.

What an array of objectives greets your trigger finger—missile bases, mine launchers, mobile laser turrets and a fireball launcher, located comfortably beneath their protective envelopment. Diving to lower altitudes increases the rapidity of your bomb assaults, but hover too near the protective shield and your ship is merely a memory.

The missiles fly at you from two directions, with filling-shaking nuclear airbursts attempting to neutralize your threat once and for all. The mines are nasty little adversaries, for they have a form of rudimentary intelligence which causes them to follow you. Contact with a mine means another lost attack ship.

The indestructible fireballs can be avoided somewhat easily at the lower skill levels, but it is the smart pilot who flattens the fireball launcher as soon as possible, regardless of the skill level selected.

Once all enemy ground impediments have been removed, you are free to descend into a destroyed fireball launcher. This will initiate the second phase of Marauder. More than a casual attitude toward this maneuver is recommended. For, if part of the force field is still operational, or you manage to miss the opening, your ship is immediately destroyed. In other words, take nothing for granted and be skillful in your rush to begin the second level.

The screen clears and you watch as your ship lands adjacent to a power station. All about are rooms containing mazes. You must find the planet's power core and wreak havoc and destruction upon it. Actually, a single blast from your hand weapon will start the ball rolling.

Once the power core has begun to deteriorate, the planet is totally doomed. You have 2000 time units to get your little body back to your ship and leave the planet before the ceilings cave in...literally. The power center is worth whatever bonus points are on the timer when you disable it. Safely leave the doomed planet and once again you're ready to start a fresh assault upon another planet.

Oh, a slight inconvenience in this second phase are the robots. They, to be blunt about it, will try to stop you from blowing up their homeland—unreasonable little beggars! The nasty thing about these robots is that you can't see them until they are in your line of sight. Here you come, you little marauder, wheeling around a corner and running smack-dab into a gun-toting robot intent upon a rather quick autopsy of your remains. They can also see and hear you. Not that you're powerless against these emissaries of death. You can outmaneuver them and you have your own weapon which will destroy them. It's just that there are so many of the tin men seeking your death that one gets the impression of not being too well liked.

Phase one gratuitously gives you three ships to start the game, and you have a total of three marauder ships with which to garner success in the second phase. Should you ever reach the point in a certain skill level that confidence causes rare bravado, merely increase the skill level to one that will offer challenge.

In both phases, upper screen displays indicate the current high score, the number of ships you have remaining, the total number of marauders you can command, a bonus timer, a boost indicator and your current score. The escape key halts your game in progress; pressing any other key restarts the battle. On-Line's thoughtfulness allows you to restart the game at any time, should the baddies prove too rough.

The main menu is available by pressing a Ctrl-C. The sound may be toggled on or off.

As far as playing modes, either the keyboard or a joystick may be utilized. Graphically, Marauder is well-done. The sound effects are quite appropriate. Utility-key features are a pleasant addition. The coding of the program is, without question, above average. A great deal of thought went into Marauder to enable maximum enjoyment. This is not an arcade game you will tire of too soon.

The price may seem a little steep, but remember, you're actually obtaining three games in one. Perhaps, in this manner, the consumer of software will, once again, get what he or she deserves...playability and a bargain! *(On-line Systems, 36575 Mudge Ranch Road, Coarsegold, CA 93675. $34.95.)*

Hartley Lesser
Hancock, NH

Run This Program And Jog Your Memory

This program for the VIC-20 features four colorful and musical games which test and improve memory capabilities.

By Zoltan Szepesi

Listing 1. Repeat the Sequence program for the VIC-20.

```
 5 REM REPEAT THE SEQUENCE C.1982 ZOLTAN SZEPESI
 10 REM 2611 SAYBROOK DRIVE  PITTSBURGH,PA 15235
 14 REM**INITIALISATION**************
 15 POKE36879,13:PRINT"■"
 20 PRINT"■■FOUR WAYS TO PLAY:  ■    1.OWN MADE SEQUENCE ■  2.REPEATING SEQUENC
E"
 25 PRINT"  3.CHANGING SEQUENCE   ■4.SINGLE FLASHES"
 30 PRINT"■■■PRESS THE NUMBER:";
 35 GETA$:IFA$=""THEN35
 40 X=VAL(A$):PRINTX
 45 PRINT"■■■FOR INCREASING       DIFFICULTY LEVEL      PRESS F1, F3,F5 OR F7"
 50 GETA$:IFA$=""THEN50
 55 IFA$=CHR$(133)THENT1=100:N1=4:T2=5
 60 IFA$=CHR$(134)THENT1=50:N1=8:T2=3
 65 IFA$=CHR$(135)THENT1=10:N1=16:T2=2
 70 IFA$=CHR$(136)THENT1=1:N1=32:T2=1
 75 B$="■■■■■■■■■■■■■■■":C$="PURP ■GREEN  ■BLUE  ■YELL"
 80 DIMK(32):V=36878:T=36876:S=7790:CO=38510:G=0:TT=0
 85 NM=1:G=G+1:Q=0
 90 PRINT"■"B$C$:W=RND(-TI)
 95 ONXGOTO200,250,300,350
 199 REM**OWN MADE SEQUENCES********
 200 PRINT"■VIC GIVES THE FIRST   COLOR":N=1:K(1)=INT(RND(1)*4):GOSUB400
 205 GOSUB450:IFQ<>0THEN700
 210 NM=NM+1:N=NM:PRINT"■ADD A NEW COLOR":T3=TI
 215 GETA$:IFA$=""ANDTI-T3<T2*60THEN215
 220 IFTI-T3>T2*50THEN500
 225 K(N)=VAL(A$)-5:GOSUB400:GOSUB450:IFQ<>0THEN700
 230 GOTO210
 249 REM**REPEATING SEQUENCES*******
 250 PRINT"■VIC GIVES THE SEQUENCE":N=NM:K(N)=INT(RND(1)*4):GOSUB400
 255 GOSUB450:IFQ<>0THEN700
 260 FORI=1TO800:NEXT
 265 FORN=1TONM:PRINT"■VIC GIVES THE SEQUENCE":GOSUB400:NEXTN
 270 NM=NM+1:GOTO250
 275 FORI=1TO800:NEXT
 299 REM**CHANGING SEQUENCES********
 300 FORN=1TONM:PRINT"■VIC GIVES THE SEQUENCE":K(N)=INT(RND(1)*4)
 305 GOSUB400:NEXTN:GOSUB450:IFQ<>0THEN700
 310 FORI=1TO800:NEXTI:NM=NM+1:GOTO300
 349 REM**SINGLE FLASHES*************
 350 P=1
 355 T2=1:N=1:K(N)=INT(RND(1)*4):GOSUB400:GOSUB450:IFQ<>0THEN700
 360 FORI=1TO400:NEXTI:NM=1:N=1:P=P+1:GOTO355
 399 REM**FLASHING COLOR AND SOUND**
 400 POKEV,15:POKET,135+K(N)*25:PRINT"■"B$+"■■■STEP NUMBER:";
 405 IFX=4THENPRINTP:GOTO415
 410 PRINTN
 415 FORJ=0TO4:FORL=CO+J*22+6*K(N)TOL+3:POKEL,K(N)+4:NEXTL,J
 420 FORJ=0TO4:FORI=S+J*22+6*K(N)TOI+3:POKEI,160:NEXTI,J
 425 FORJ=0TOT1:NEXTJ:POKET,0
 430 PRINT"■"B$C$
 435 RETURN
 449 REM**REPEAT THE SEQUENCE*******
 450 FORN=1TONM:PRINT"■REPEAT THE SEQUENCE":T3=TI
 455 GETA$:IFA$=""ANDTI-T3<T2*60THEN455
 460 IFTI-T3>T2*55THENQ=1:RETURN
 465 Y=VAL(A$):IFY-5<>K(N)THENQ=2:RETURN
 470 IFY-5=K(N)THENGOSUB400:NEXTN
 475 IFX=4THENN=P+1
 480 IFN=N1+1THENQ=3:RETURN
 485 RETURN
 499 REM ERROR MESSAGES**************
 500 PRINT"■■■YOU LOST-YOU WERE    ■NOT FAST ENOUGH":GOTO515
 510 PRINT"■■■ERROR-YOU LOST"
 515 FORN=1TO1:NEXTN:IFX=4THENNM=P
 520 PRINT"■"NM-1"STEPS WERE CORRECT":PRINT"■  NO. OF GAMES:"G
 525 POKEV,15:RESTORE
 530 READTN:IFTN=-1THENPOKET+1,0:GOTO600
 535 READSI:POKET+1,TN:FORI=1TO5I:NEXTI:POKET+1,0:FORI=1TO10:NEXTI:GOTO530
 540 DATA175,100,175,100,175,100,151,500,0,300,163,100,163,100,163,100,147,500,-
1
 549 REM**CORRECTLY FINISHED********
 550 PRINT"■■■CONGRATULATIONS.      ■YOU FINISHED WITH    ■"N1;"POINTS"
 555 PRINT"■NO. OF GAMES:"G:TT=TT+N1:PRINT"■■■YOUR TOTAL IS:"TT
 560 PRINT"■  POINTS":POKEV,15:RESTORE
```

More →

The Repeat the Sequence program enables you to play three games which exercise and improve both your visual and auditive memory. Another game in this program is useful for checking your reaction speed. The program (Listing 1) is written in Basic for the Commodore VIC-20 computer, but it could be modified for use on other computers. In Listing 2 is the program converted for the CBM/PET.

The basic idea of these games is the same as that of the SIMON (copyright 1979 Milton Bradley Co.) However, by using the computer with its display, a better communication between machine and player can be achieved.

There are four different color squares displayed at four different places on the TV screen. Single color flashes are presented in random order, each accompanied by their special sound flash. You have to repeat it by pressing the same color keys (without pressing the control key). The colors used are purple, green, blue and yellow; consequently, the keys 5, 6, 7 and 8 have to be pressed. If you repeat the color and sound flashes correctly, the game continues. Descriptions of the four games follow.

Game 1. Create the Sequence.

After you have repeated the first signal VIC gave, you have to add another signal. Following that, you have to repeat the sequence of the previous signals and add another to it. Continue this way, until a given number of steps is finished (see Table 1), when VIC salutes you with the first eight notes of Beethoven's 5th Symphony. If you were not fast enough, or you made a mistake in repeating the sequence correctly, VIC gives a noisy sequence of the 5th Symphony and the game is finished. You could still choose to hear the last correctly repeated sequence.

Before starting with each game you

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Listing 1 continued.

```
565 READTN:IFTN=-1THEN600
570 READSI:POKET,TN:FORI=1TOSI:NEXTI:POKET,0:FORI=1TO10:NEXTI:GOTO565
599 REM**SEE THE LAST SEQUENCE*****
600 IFX=30ORX=4THEN650
605 IFNM=1AND(X=1ORX=2)THEN650
610 PRINT"■■DO YOU WANT TO SEE  ■THE LAST SEQUENCE(Y/N)"
615 GETA$:IFA$=""THEN615
620 IFA$<>"Y"ANDA$<>"N"THEN615
625 IFA$="Y"THEN PRINT"□"B$C$
630 IFA$="N"THEN650
635 IFN=N1+1THENNM=NM+1
640 FORN=1TONM-1:GOSUB400:NEXTN
649 REM**WANT TO CONTINUE?*********
650 PRINT"□■■DO YOU WANT TO        ■1.CONTINUE SAME WAY   ■2.CONTINUE WITH
655 PRINT"   ■CHANGED CONDITIONS  ■3.FINISH.            ■■PRESS THE NUMBER."
660 GETA$:IFA$=""THEN660
665 Y=VAL(A$):IFY<>1ANDY<>2ANDY<>3THEN660
670 ONYGOTO85,675,680
675 RUN
680 END
699 REM**FOR STACK CLEARING********
700 IFQ=1THENQ=0:GOTO500
705 IFQ=2THENQ=0:GOTO510
710 IFQ=3THENQ=0:GOTO550
READY.
```

Function key	Number of sequences	Time between signals	Time allowed to you
F1	4	100	5 seconds
F3	8	50	3 seconds
F5	16	10	2 seconds
F7	32	1	1 second

Table 1. Difficulty levels within a given game.

Listing 2. Repeat the Sequence program for the PET.

```
5 REM REPEAT FOR PET/CBM C. BY Z.SZEPESI.2611 SAYBROOK DRIVE,PITTSBURGH,PA
10 PRINT"□ ***REPEAT THE SEQUENCE***"
15 PRINT"                              ":PRINT"■■DO YOU WANT INSTRUCTIONS (Y OR ANY)"
20 GETA$:IFA$=""THEN20
25 IFA$="Y"THENGOSUB900
29 REM**INITIALISATION**********************
30 DIMK(32):S=33010:V=59467:H=59466:T=59464:G=0:TT=0
35 PRINT"□■■ **FOUR WAYS TO PLAY:                    ■  1.OWN MADE SEQUENCE"
40 PRINT"■    2.REPEATING SEQUENCE"
45 PRINT"■    3.CHANGING SEQUENCE                    ■ 4.SINGLE FLASHES"
50 PRINT"■■**PRESS THE NUMBER:";
55 GETA$:IFA$=""THEN55
60 X=VAL(A$):IFA$="+"THENX=4
65 PRINTX:PRINT"■■**FOR INCREASING DIFFICULTY LEVEL          PRESS 1,2,3 OR 4"
70 GETA$:IFA$=""THEN70
75 A=VAL(A$):IFA$="+"THENA=4
80 IFA=1THENT1=100:N1=4:T2=5
85 IFA=2THENT1=50:N1=8:T2=3
90 IFA=3THENT1=10:N1=16:T2=2
95 IFA=4THENT1=1:N1=32:T2=1
100 C$="■■■■■     1       2       3       +"
105 NM=1:G=G+1:Q=0
110 PRINT"□"C$:W=RND(-TI)
115 ONXGOTO200,250,300,350
199 REM**OWN MADE SEQUENCES*****************
200 PRINT"■ PET GIVES THE FIRST COLOR":N=1:K(1)=INT(RND(1)*4):GOSUB400
205 GOSUB450:IFQ<>0THEN700
210 NM=NM+1:N=NM:PRINT"■  ADD A NEW COLOR":T3=TI
215 GETA$:IFA$=""ANDTI-T3<T2*60THEN215
220 IFTI-T3>T2*50THEN500
225 K(N)=VAL(A$)-1:IFA$="+"THENK(N)=3
230 GOSUB400:GOSUB450:IFQ<>0THEN700
235 GOTO210
249 REM**REPEATING SEQUENCES***************
250 PRINT"■  MEMORIZE THE SEQUENCE":N=NM:K(N)=INT(RND(1)*4):GOSUB400
255 GOSUB450:IFQ<>0THEN700
260 FORI=1TO800:NEXT
265 FORN=1TONM:PRINT"■  MEMORIZE THE SEQUENCE":GOSUB400:NEXTN
270 NM=NM+1:GOTO250
275 FORI=1TO400:NEXTI
299 REM**CHANGING SEQUENCES*****************
300 FORN=1TONM:PRINT"■ MEMORIZE THE SEQUENCE":K(N)=INT(RND(1)*4)
305 GOSUB400:NEXTN:GOSUB450:IFQ<>0THEN700
310 FORI=1TO400:NEXTI:NM=NM+1:GOTO300
349 REM**SINGLE FLASHES*********************
350 P=1
355 T2=1:N=1:K(N)=INT(RND(1)*4):GOSUB400:GOSUB450:IFQ<>0THEN700
360 FORI=1TO400:NEXTI:NM=1:N=1:P=P+1:GOTO355
399 REM**FLASHING COLOR AND SOUND***********
```

More →

Listing 2 continued.

```
400 POKEV,16:POKEH,1:POKET,135+K(N)*25:PRINT"■■STEP NUMBER:";
405 IFX=4THENPRINTP:GOTO415
410 PRINTN
415 FORJ=0TO6:FORI=S+J*40+7*K(N)TOI+6:POKEI,160:NEXTI,J
420 FORJ=0TOT1:NEXTJ:POKEV,0:POKEH,0:POKET,0
425 PRINT"■"C$
430 RETURN
449 REM**REPEAT THE SEQUENCE***************
450 FORN=1TONM:PRINT"■  REPEAT THE SEQUENCE":T3=TI
455 GETA$:IFA$=""ANDTI-T3<T2*60THEN455
460 IFTI-T3>T2*55THENQ=1:RETURN
465 Y=VAL(A$)-1:IFA$="+"THENY=3
470 IFY<>K(N)THENQ=2:RETURN
475 IFY=K(N)THENGOSUB400:NEXTN
480 IFX=4THENN=P+1
485 IFN=N1+1THENQ=3:RETURN
490 RETURN
499 REM**ERROR MESSAGES*********************
500 PRINT"■■■YOU LOST-YOU WERE NOT FAST ENOUGH":GOTO515
510 PRINT"■■■ERROR-YOU LOST"
515 FORN=1TO1:NEXTN:IFX=4THENNM=P
520 PRINT"■"NM-1"STEPS WERE CORRECT"
525 PRINT"■  NO. OF GAMES:"G
530 FORJ=1TO500:NEXTJ:GOTO600
549 REM**CORRECTLY FINISHED***************
550 PRINT"■■■**CONGRATULATIONS. YOU FINISHED          ■WITH"N1;"POINTS"
555 PRINT"■  NO. OF GAMES:"G:TT=TT+N1:PRINT"■■*YOUR TOTAL IS:"TT" POINTS"
560 GOSUB800
599 REM**SEE THE LAST SEQUENCE*************
600 IFX=3ORX=4THEN650
605 IFNM=1AND(X=1ORX=2)THEN650
610 PRINT"■■DO YOU WANT TO SEE THE LAST              ■SEQUENCE(Y/N)"
615 GETA$:IFA$=""THEN615
620 IFA$<>"Y"ANDA$<>"N"THEN615
625 IFA$="Y"THEN PRINT"■"B$C$
630 IFA$="N"THEN650
635 IFN=N1+1THENNM=NM+1
640 FORN=1TONM-1:GOSUB400:NEXTN
649 REM**WANT TO CONTINUE?*****************
650 PRINT"■■■DO YOU WANT TO                          ■1.CONTINUE SAME WAY"
655 PRINT"    ■2.CONTINUE WITH CHANGED CONDITIONS    ■3.FINISH.
660 PRINT"■■PRESS THE NUMBER"
665 GETA$:IFA$=""THEN665
670 Y=VAL(A$):IFY<>1ANDY<>2ANDY<>3THEN665
675 ONYGOTO105,680,685
680 GOTO35
685 END
699 REM**FOR STACK CLEARING*****************
700 IFQ=1THENQ=0:GOTO500
705 IFQ=2THENQ=0:GOTO510
710 IFQ=3THENQ=0:GOTO550
799 REM**5-TH SYMPHONY**********************
800 RESTORE:POKEV,16:POKEH,1:FORI=1TO9:READB:READSI:POKET,B:FORJ=1TOSI:NEXTJ
805 FORJ=1TO10:POKET,0:NEXTJ:NEXTI
810 POKEV,0:POKEH,0:POKET,0:RETURN
815 DATA 157,100,157,100,157,100,199,500,0,300,177,100,177,100,177,100,211,500
899 REM**INSTRUCTIONS**********************
900 PRINT"■■■YOU SEE FOUR DIFFERENT SQUARES FLASHED"
905 PRINT"■IN RANDOM ORDER, EACH ACCOMPANIED BY"
910 PRINT"■THEIR SPECIAL SOUND FLASHES.YOU HAVE"
915 PRINT"■TO REPEAT THE FLASH SEQUENCES BY"
920 PRINT"■PRESSING THE KEYS:1,2,3 OR +, ACCORDING"
925 PRINT"■TO THE ORDER OF SQUARE POSITIONS.IF YOU"
930 PRINT"■REPEAT THE SQUARE AND SOUND FLASHES"
935 PRINT"■CORRECTLY, THE GAME CONTINUES.":PRINT"■■PRESS ANY KEY TO START."
940 GETA$:IFA$=""THEN940
945 RETURN
```

can choose one of four difficulty levels by pressing one of the programmable function keys (F1, F3, F5 or F7). Table 1 lists the different parameters defined by these keys.

When the function key F3 is pressed (after the VIC asks it at the start of the game), eight sequences have to be correctly repeated for successfully finishing the game. The time lag between signals will be short and you have to push the proper color within three seconds after the previous color was pushed.

Game 2. Repeating Sequence.

VIC starts by giving one signal. After you have repeated it successfully, VIC repeats the previous signal and adds one new signal. You have to repeat this sequence again. In following steps, VIC repeats the previous sequence and adds a new one until the series is completed according to the number of sequences chosen.

Game 3. Changing Sequence.

This game is very much the same as Game 2. The only difference is that VIC does not repeat the previously given sequence, but always starts a new sequence with one more signal in it.

Game 4. Single Flashes.

In this game VIC gives only one signal at a time and you have to repeat it within one second.

Table 2 shows the statement numbers and subjects of the different sections of the program. The list of main variables is shown in Table 3.

The variables N1, T1 and T2 are fixed by the four programmable keys in statements 55 to 70. You can change them by changing the numbers in these statements. The time between flashes (T1) is only a relative value. It is in addition to the time it takes to display the color square. T2 is in seconds. In Game 4, T2 is redefined in statement 355.

Since from the subroutine "REPEAT THE SEQUENCE" (statements 450 to 485) the program exits at given circumstances without using the return command, the stack could be filled (after about 13 games at the same game number) and an error message "OUT OF MEMORY" could turn out. To avoid this disaster, three more return commands were put in this subroutine with flag QQ. Following the subroutine "FOR STACK CLEARING" (statements 700 to 710) gives the proper jump statement.

Similar stack filling can also happen when a FOR. . . NEXT loop is left before ending it. The first part of statement 515 clears up this problem.

The program needs 3127 bytes of memory; another 340 bytes are needed when it is executed. ★

Statement No.	Subject and remarks
5–10	Title and author
15–95	Initialization. Choose game number and difficulty level
200–230	Main program of game 1
250–275	Main program of game 2
300–310	Main program of game 3
350–360	Main program of game 4
400–435	Subroutine of color and sound flashes
450–485	Subroutine for repeating the sequence
500–520	Error messages
525–540	Noisy signals
550–570	Correct finish. Playing 5th Symphony. (Data in 540)
600–640	Repeat last correct sequence?
650–680	Want to continue?
700–710	For STACK clearing

Table 2. List of principal sections of the program.

Variable	Remarks
B$	11 cursor down + purple code
C$	marking of color spots
C0	color memory location
G	number of games in the same kind of game
K(N)	position of color spot at N-th flash in the sequence
N1	maximum number of flashes in a sequence
NM	number of flashes in a given sequence
P	number of flashes in game 4
Q	flag when exit from subroutine
S	screen memory location
SI	duration of musical notes
T	voice number address
T1	time between flashes (see explanation below)
T2	time delay allowed, in seconds, when repeating flashes
T3	clock status, when measuring time delay T2
TN	pitch code of musical notes
TT	total number of points in the same kind of game
X	game number

Table 3. List of main variables.

A Subroutine Library At Your Fingertips

Get organized in the use of subroutines by creating a subroutine library with Apple DOS.

By Lawrence Kubicz

If you do a fair amount of programming, you've probably noticed yourself using some of the same subroutines over and over in a variety of programs.

Functions like disk file handling, dollar formatting, menu selection, error handling and variations on the somewhat limited Input statement crop up repeatedly. I refer to the subroutines I write to implement these functions as "utility" subroutines.

Without an organized approach to using these subroutines, they must be reinvented (or at least reentered) each time they are used. Imagine how much easier your programming would be if you could just select the needed routines from a catalog and insert them into your programs. The Apple DOS Exec command provides such a capability.

Exec is a seldom-used command; it's usually encountered when the programmer needs to do something exotic, like the initializing of diskettes from within a program or the translating of Integer to Applesoft Basic. The Apple DOS manual lists several other applications, including the inserting of subroutines into existing programs.

Essentially, the Exec command reads a sequential text file from the disk and treats the input data just as if it had been entered from the keyboard.

If the text file contains a program listing, that program would be entered into memory. Sounds just like the Load command, doesn't it? Unlike Load, however, Exec used in this manner will not erase the program already in memory.

That characteristic is what gives the Exec command the ability to insert lines into an existing program. Before discussing how to use this capability, a summary on the effective use of subroutines is in order.

```
92  HTAB 20-INT(LEN(T9$)/2):PRINT T9$: RETURN
```

Listing 1. Example of a utility subroutine.

```
1   REM ** SUB-CATCHER **
2   D$ = CHR$(4): REM CTRL-D
3   HOME: PRINT: PRINT "SUB-CATCHER"
4   VTAB 6: CALL -868: INPUT "HAVE YOU INSERTED LINE NUMBERS IN
    LINE 13? "; R$: R$ = LEFT$(R$,1)
5   IF R$="Y" THEN 9
6   IF R$<> "N" THEN 4
7   PRINT: PRINT "INSERT THEM NOW, BY RE-ENTERING LINE 13.":
    PRINT "THEN, RUN THE PROGRAM AGAIN.": PRINT: LIST 13: PRINT: END
8   VTAB 10: HTAB 21: FLASH: PRINT "INVALID FILE NAME": NORMAL: FOR
    I = 1 TO 500: NEXT I
9   VTAB 10: CALL -868: INPUT "SUBROUTINE NAME-->";N$: N= ASC
    (LEFT$(N$,1)): IF N<65 OR N>90 THEN 8
10  PRINT: PRINT D$; "OPEN"; N$
11  PRINT D$; "WRITE "; N$
12  POKE 33,30
13  LIST 1,2
14  PRINT D$; "CLOSE"; N$
15  TEXT: HOME: END
```

Listing 2. The Apple Sub-Catcher program allows storage of subroutines using their individual names and line numbers.

Organizing Your Subroutines

If you plan to use a subroutine in a variety of programs, it's a good idea to use the same line numbers for the sub-

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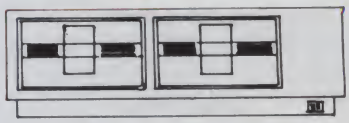

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routine. By doing so, you will always know where to GOSUB for a particular function. In addition, this procedure will ensure that the desired line numbers are free when inserting the subroutine into a program.

With this in mind, it is a sound practice to reserve a block of line numbers for all your utility subroutines, many of which may remain unused in a particular application.

But which line numbers do you reserve for this purpose?

A subroutine call initiates a search for the line number called, starting at the beginning of the program and proceeding line-by-line until the desired line number is found. Placing frequently-used subroutines at the beginning of the program will result in faster execution. I normally reserve lines 40–499 for my utility subroutines, with a GOTO 500 in line 39 to get to the main body of the program.

Since your utility subroutines will be used frequently, and therefore will be well debugged, there is no need to leave modification space between line numbers. You may use consecutive line numbers without worrying about the need for inserting modifications, thereby squeezing a lot of programming into a short range of lines.

It's vitally important to keep track of variables. If you use a variable in a subroutine while the variable is being used in the body of your program, the subroutine may make unwanted changes in the value of the variable, leading to subtle logical errors which are difficult to locate. For this reason, it is necessary to reserve a block of variable names for your subroutines.

There is no need to leave modification space between line numbers... thereby squeezing a lot of programming into a short range of lines.

One procedure is to use two-character variables ending in 9 (for instance T9$, I9) *only* in your utility subroutines. It's a simple matter to remember not to use variables ending in 9 in the main body of your program.

An Example Subroutine: Center Text (92)

The one-liner in Listing 1 shows a useful utility subroutine. It takes a line of text, stored in string variable *T9$*, and centers it on the Apple's video screen. You call it by setting T9$ equal to the text to be centered and executing a GOSUB 92.

For example:

```
500 HOME: T9$ = "PAGE" + STR$(P):GOSUB 92
```

will print a page number at top-center on the screen.

Note that I have included the line number in the subroutine's name—Center Text (92). This is the name of the text file in which the subroutine is stored. Including the line number in the name makes it easier to remember where to GOSUB to execute the desired function.

Creating And Using A Subroutine Text File

The Apple DOS manual lists a short program which will capture a program listing and save it in a text file called "Listing."

A more generalized program, called "Sub-Catcher," is shown in Listing 2. This program permits you to store subroutines using their individual names and specified line numbers. You should save this program by using the procedure described below, rather than by using the Apple DOS Save command.

In other words, you should use Sub-Catcher to save itself. This allows you

to insert Sub-Catcher *after* writing and debugging your subroutine, and then to use it to store the desired lines in a text file.

Saving Sub-Catcher as a program will only allow you to load it *before* writing your subroutine. Otherwise, loading the program would erase your existing program.

In order to use Sub-Catcher, it must reside in memory along with the subroutine to be saved in a text file. To save the Sub-Catcher program itself, simply enter the program from the keyboard. To save a separate subroutine, first write and debug the subroutine, then use the Exec procedure described below to append Sub-Catcher to the routine already in memory. (The Sub-Catcher text file should have been saved previously to do this.)

Next, change the line numbers in Line 13 to correspond with the range of line numbers in the subroutine to be saved. If you are saving Sub-Catcher, Line 13 should read:

```
13 LIST 1,15
```

To save Center Text (92), use:

```
13 LIST 92
```

since the subroutine consists of only one line.

Then, simply run the program. Use the Applesoft Run command, rather than the DOS Run Sub-Catcher command, since Sub-Catcher does not exist as a program file on the disk. If you forget to change Line 13 before running the program, the procedures in lines 4–7 will give you an opportunity to do so.

The only thing left to do is to enter a legal file name in response to the query Subroutine Name—>. A legal file name begins with a letter of the alphabet and contains no commas. The program contains a check to ensure that only a legal file name is accepted.

The program will then create a text file with the desired name, consisting of a listing of the program lines designated in line 13. The subroutine later may be inserted into an existing program by simply entering Exec followed by the subroutine name, and then hitting Return.

My subroutine library contains many other useful functions, such as an improved version of the Input statement, random-access disk routines, dollar formatting, a printer tab function, time-delay or pause, ability to clear a specified space on the screen, "keystroke" entry queries, menu selection and error handling routines.■

The Perfect Mate For the IBM PC

This is no silent partner; the PC-Mate Speech Master synthesizer board from Tecmar gives quality speech to your IBM.

By James Derry

Would you like your IBM Personal Computer to talk to you? There is a speech synthesizer board that can do just that—the PC-Mate Speech Master from Tecmar, Inc. (23600 Mercantile Road, Cleveland, OH 44122). The board costs $395 and is one of the products in the PC-Mate line of expansion chassis, memory and board add-ons for the IBM Personal Computer from Tecmar. This board will go into any expansion slot in the IBM PC or the PC-Mate.

It performs text-to-speech conversion using both phoneme access, with the Federal Screw Works Votrax chip, and fixed vocabulary in ROM, with National Semiconductor's Speech Processor Chip (SPC). The software driver (SPEECH) for the board is supplied on disk and is functionally an overlay to PC-DOS. It does its job with minimal programming effort on the part of the user.

Hardware

National Semiconductor's SPC, the Digitalker, comes with vocabulary in pairs of ROMs and delivers high-quality nonmechanical speech. The two-ROM set that comes with the Speech Master contains 143 words; two more ROMs would yield another 100 to 150 words. Since there are eight sockets for ROMs, there is a possible vocabulary of about 560 words. Additional vocabulary ROMs are available in pairs in add-on kits.

Votrax, on the other hand, works with phonemes and has no problems with enunciating words without a lexicon. This chip produces speech which has a flat, mechanical quality —without inflection or variance—but the Speech Master board does permit some output compensations.

There are three trim pots on the board for tone and volume control. They are located at the top so they can be reached and tweaked with the board installed and running. You can use them to match the Votrax and Digitalker output, adjust the board speaker volume and adjust phoneme pitch.

DIP switches are used to set the board's base address, 0B00 (hexadecimal). Actually, the Speech Master uses four ports—0B00 through 0B03. The first two of these ports are used for controlling access to the fixed vocabulary, the third is for phoneme access and the fourth for interrupts, status and module selection.

Interrupts shouldn't be used until you understand their use in the IBM PC. A single jumper (only one, no more) may be used to gain access to one interrupt request line out of the six that are available.

Speech Master has an on-board mixer, amplifier and speaker, which is enough for most tasks. An RCA phone plug is available on-board to enable use of an external speaker if that's needed. Power available on the board is adequate to drive an 8-ohm speaker, but anything more than that will experience distortion unless it has its own power and amplifier.

Software

Driver software must be reloaded when the computer is powered up and after each program reset. Do this by running the program named English. Once this software is loaded, output from the Speech Master can be obtained via print statements. For example, a Basic print instruction

```
LPRINT CHR$(255) + "HOW ARE YOU TODAY?"
```

would transmit the message to the talker instead of the printer due to the presence of the special character, CHR$(255), transmitted in the lead position. This example would select the Votrax device and the output would be phonemic.

One of the nice features of the software furnished by IBM with the PC is the control-P command, which causes printer output to be displayed on the CRT screen. In similar fashion, Tecmar software for this board has been written to use a control-T command to output to both the screen and the talker. A number of special operator command choices are available that permit complete flexibility in the choice of output modes.

Using Vocabulary

The vocabulary furnished in the two ROMs on the board is shown in Table 1.

Address correspondence to James Derry, 1538 Rowles Drive, Akron, OH 44313.

If you want to use any of these words, select the Digitalker with a CHR$(254) and then specify them in the following manner:

```
LPRINT CHR$(254)+CHR$(26)+CHR$(77)
+CHR$(129)
```

This message is, "Eighty degrees."

Using Phonemes

Phonemes available with the Votrax chip are given in Table 2; Table 3 has the same list rearranged according to the type of sound involved.

Software adjustment for the flatness of the phoneme speech output is done with pauses based upon encountering (and recognizing) commas, periods, colons and semicolons. Pitch changes are also used to inflect sentence completion at a period and inquiry at a question mark.

Speech output is also better if you spell words phonetically, such as "compewter" in place of "computer." The program listing might look bad, but the sound will improve. Experiment a little.

In order to output the message "Eighty degrees" using phonemes, select the Votrax chip with the code CHR$(255) and give it the text:

```
LPRINT CHR$(255) + "EIGHTY DEGREES"
```

Vocabulary and phoneme outputs may be mixed if you want the best of both worlds.

More Advanced Programming

There are more complicated matters for those who like to deal with such things. Fortunately, you don't need to know assembly language because sufficient instructions are avail-

Word	Code	Word	Word	Code	Word	Word	Code	Word
0	(0 Hex)	This is digitalker	48	(30 Hex)	Q	96	(60 Hex)	Is
1	(1 Hex)	One	49	(31 Hex)	R	97	(61 Hex)	It
2	(2 Hex)	Two	50	(32 Hex)	S	98	(62 Hex)	Kilo
3	(3 Hex)	Three	51	(33 Hex)	T	99	(63 Hex)	Left
4	(4 Hex)	Four	52	(34 Hex)	U	100	(64 Hex)	Less
5	(5 Hex)	Five	53	(35 Hex)	V	101	(65 Hex)	Lesser
6	(6 Hex)	Six	54	(36 Hex)	W	102	(66 Hex)	Limit
7	(7 Hex)	Seven	55	(37 Hex)	X	103	(67 Hex)	Low
8	(8 Hex)	Eight	56	(38 Hex)	Y	104	(68 Hex)	Lower
9	(9 Hex)	Nine	57	(39 Hex)	Z	105	(69 Hex)	Mark
10	(A Hex)	Ten	58	(3A Hex)	Again	106	(6A Hex)	Meter
11	(B Hex)	Eleven	59	(3B Hex)	Ampere	107	(6B Hex)	Mile
12	(C Hex)	Twelve	60	(3C Hex)	And	108	(6C Hex)	Milli
13	(D Hex)	Thirteen	61	(3D Hex)	At	109	(6D Hex)	Minus
14	(E Hex)	Fourteen	62	(3E Hex)	Cancel	110	(6E Hex)	Minute
15	(F Hex)	Fifteen	63	(3F Hex)	Case	111	(6F Hex)	Near
16	(10 Hex)	Sixteen	64	(40 Hex)	Cent	112	(70 Hex)	Number
17	(11 Hex)	Seventeen	65	(41 Hex)	400Hz Tone	113	(71 Hex)	Of
18	(12 Hex)	Eighteen	66	(42 Hex)	80Hz Tone	114	(72 Hex)	Off
19	(13 Hex)	Nineteen	67	(43 Hex)	20MS Silence	115	(73 Hex)	On
20	(14 Hex)	Twenty	68	(44 Hex)	40MS Silence	116	(74 Hex)	Out
21	(15 Hex)	Thirty	69	(45 Hex)	80MS Silence	117	(75 Hex)	Over
22	(16 Hex)	Forty	70	(46 Hex)	160MS Silence	118	(76 Hex)	Parenthesis
23	(17 Hex)	Fifty	71	(47 Hex)	320MS Silence	119	(77 Hex)	Percent
24	(18 Hex)	Sixty	72	(48 Hex)	Centi	120	(78 Hex)	Please
25	(19 Hex)	Seventy	73	(49 Hex)	Check	121	(79 Hex)	Plus
26	(1A Hex)	Eighty	74	(4A Hex)	Comma	122	(7A Hex)	Point
27	(1B Hex)	Ninety	75	(4B Hex)	Control	123	(7B Hex)	Pound
28	(1C Hex)	Hundred	76	(4C Hex)	Danger	124	(7C Hex)	Pulses
29	(1D Hex)	Thousand	77	(4D Hex)	Degree	125	(7D Hex)	Rate
30	(1E Hex)	Million	78	(4E Hex)	Dollar	126	(7E Hex)	Re
31	(1F Hex)	Zero	79	(4F Hex)	Down	127	(7F Hex)	Ready
32	(20 Hex)	A	80	(50 Hex)	Equal	128	(80 Hex)	Right
33	(21 Hex)	B	81	(51 Hex)	Error	129	(81 Hex)	SS (1)
34	(22 Hex)	C	82	(52 Hex)	Feet	130	(82 Hex)	Second
35	(23 Hex)	D	83	(53 Hex)	Flow	131	(83 Hex)	Set
36	(24 Hex)	E	84	(54 Hex)	Fuel	132	(84 Hex)	Space
37	(25 Hex)	F	85	(55 Hex)	Gallon	133	(85 Hex)	Speed
38	(26 Hex)	G	86	(56 Hex)	Go	134	(86 Hex)	Star
39	(27 Hex)	H	87	(57 Hex)	Gram	135	(87 Hex)	Start
40	(28 Hex)	I	88	(58 Hex)	Great	136	(88 Hex)	Stop
41	(29 Hex)	J	89	(59 Hex)	Greater	137	(89 Hex)	Than
42	(2A Hex)	K	90	(5A Hex)	Have	138	(8A Hex)	The
43	(2B Hex)	L	91	(5B Hex)	High	139	(8B Hex)	Time
44	(2C Hex)	M	92	(5C Hex)	Higher	140	(8C Hex)	Try
45	(2D Hex)	N	93	(5D Hex)	Hour	141	(8D Hex)	Up
46	(2E Hex)	O	94	(5E Hex)	In	142	(8E Hex)	Volt
47	(2F Hex)	P	95	(5F Hex)	Inches	143	(8F Hex)	Weight (2)

Note 1: 'SS' makes any singular word plural. 'S' must be the statement that follows the word that is to be plural. It adds an 'S' to that statement. For example, 'DOG' becomes 'DOGS'.

Note 2: Address 143 is the last legal address in this particular word list. Exceeding address 143 will produce pieces of unintelligible invalid speech data.

Table 1. Vocabulary contained in the National Semiconductor SPC Digitalker ROMs furnished with the Tecmar PC-Mate Speech Master.

able in Basic.

You will find that the Digitalker output can be terminated before it is complete by presenting the next request to the input port before the prior instruction is finished. The Votrax chip, on the other hand, doesn't turn off a phoneme until it is commanded to do so.

Communication with the Speech Master is handled through the four ports that carry the addresses 0B00 through 0B03 (2816 through 2819 decimal).

The documentation that comes with the board contains two small Basic demonstration routines illustrating methods of handling the devices (see Listing 1).

The Out function transmits data that follows the comma to the given address; e.g., line 30 transmits an 8 to address 2819 (which turns on bit 3 and turns off all other bits) to enable the Votrax chip. The program then calls for the 64 phonemes available to be spoken in turn, each executing the loop in lines 100 and 110 while waiting for the previous phoneme to finish.

A similar demonstration program is available to exercise the SPC Digitalker chip and the ROM vocabulary. The SPC is enabled by turning on bit 2, address 2819, and turning off all other bits at that address, line 30 (see Listing 2).

Applications

Uses for the Speech Master have been found in business and industrial

Phoneme Codes	Phoneme Symbol	Duration in mscc.	Example Word	Phoneme Codes	Phoneme Symbol	Duration (ms)	Example Word
0 (00 Hex)	EH3	59	jacket	32 (20 Hex)	A	185	day
1 (01 Hex)	EH2	71	enlist	33 (21 Hex)	AY	65	day
2 (02 Hex)	EH1	121	heavy	34 (22 Hex)	Y1	80	yard
3 (03 Hex)	PA0	47	no sound	35 (23 Hex)	UH3	47	mission
4 (04 Hex)	DT	47	butter	36 (24 Hex)	AH	250	mop
5 (05 Hex)	A2	71	made	37 (25 Hex)	P	103	past
6 (06 Hex)	A1	103	made	38 (26 Hex)	O	185	cold
7 (07 Hex)	ZH	90	azure	39 (27 Hex)	I	185	pin
8 (08 Hex)	AH2	71	honest	40 (28 Hex)	U	185	move
9 (09 Hex)	13	55	inhibit	41 (29 Hex)	Y	103	any
10 (0A Hex)	12	80	inhibit	42 (2A Hex)	T	71	tap
11 (0B Hex)	11	121	inhibit	43 (2B Hex)	R	90	red
12 (0C Hex)	M	103	mat	44 (2C Hex)	E	185	meet
13 (0D Hex)	N	80	sun	45 (2D Hex)	W	80	win
14 (0E Hex)	B	71	bag	46 (2E Hex)	AE	185	dad
15 (0F Hex)	V	71	van	47 (2F Hex)	AE1	103	after
16 (10 Hex)	CH*	71	chip	48 (30 Hex)	AW2	90	salty
17 (11 Hex)	SH	121	shop	49 (31 Hex)	UH2	71	about
18 (12 Hex)	Z	71	zoo	50 (32 Hex)	UH1	103	uncle
19 (13 Hex)	AW1	146	lawful	51 (33 Hex)	UH	185	cup
20 (14 Hex)	NG	121	thing	52 (34 Hex)	O2	80	for
21 (15 Hex)	AH1	146	father	53 (35 Hex)	O1	121	aboard
22 (16 Hex)	001	103	looking	54 (36 Hex)	IU	59	you
23 (17 Hex)	00	185	book	55 (37 Hex)	U1	90	you
24 (18 Hex)	L	103	land	56 (38 Hex)	THV	80	the
25 (19 Hex)	K	80	trick	57 (39 Hex)	TH	71	thin
26 (1A Hex)	J*	47	judge	58 (3A Hex)	ER	146	bird
27 (1B Hex)	H	71	hello	59 (3B Hex)	EH	185	get
28 (1C Hex)	G	71	get	60 (3C Hex)	E1	121	be
29 (1D Hex)	F	103	fast	61 (3D Hex)	AW	250	call
30 (1E Hex)	D	55	paid	62 (3E Hex)	PA1	185	no sound
31 (1F Hex)	S	90	pass	63 (3F Hex)	STOP	47	no sound

'T' must precede 'CH' to produce CH sound

'D' must precede 'J' to produce J sound

Table 2. Phonemes and their durations for the Federal Screw Works Votrax device used with the Tecmar PC-Mate Speech Master.

Phoneme Categories According to Production Features

Voiced	'Voiced' Fricat.	'Voiced' Stop	Fricative Stop	Fricative	Nasal	No Sound
E EH AE UH	OO1 Z	B	T	S	M	PAQ
F1 EH1 AE1 UH1	R ZH	D	DT	SH	N	PA1
Y EH2 AH UH2	ER J	G	K	CH	NG	STOP
Y1 EH3 AH1 UH3	L V		P	TH		
I A AH2 O	IU THV			F		
11 A1 AW O1	U			H		
12 A2 AW1 O2	U1					
13 AY AW2 OO	W					

Table 3. Votrax phonemes grouped by production features: voiced, fricative and nasal.

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TREK ADVENTURE by Bob Retelle — This one takes place aboard a familiar starship and is a must for trekkies. The problem is a familiar one — The ship is in a "decaying orbit" (the Captain never could learn to park!) and the engines are out (You would think that in all those years, they would have learned to build some that didn't die once a week). Your options are to start the engine, save the ship, get off the ship, or die. Good Luck.

Authors note to players — I wrote this one with a concordance in hand. It is very accurate — and a lot of fun. It was nice to wander around the ship instead of watching it on T.V.

CIRCLE WORLD by Bob Anderson — The Alien culture has built a huge world in the shape of a ring circling their sun. They left behind some strange creatures and a lot of advanced technology. Unfortunately, the world is headed for destruction and it is your job to save it before it plunges into the sun!

Editors note to players — In keeping with the large scale of Circle World, the author wrote a very large adventure. It has a lot of rooms and a lot of objects in them. It is a very convoluted, very complex adventure. One of our largest. Not available on OSI.

HAUNTED HOUSE by Bob Anderson — This one is for the kids. The house has ghosts, goblins, vampires and treasures — and problems designed for the 8 to 13 year old. This is a real adventure and does require some thinking and problem solving — but only for kids.

Authors note to players—This one was fun to write. The vocabulary and characters were designed for younger players and lots of things happen when they give the computer commands. This one teaches logical thought, mapping skills, and creativity while keeping their interest.

DERELICT by Rodger Olsen and Bob Anderson — For Wealth and Glory, you have to ransack a thousand year old space ship. You'll have to learn to speak their language and operate the machinery they left behind. The hardest problem of all is to live through it.

Authors note to players — This adventure is the new winner in the "Toughest Adventure at Aardvark Sweepstakes". Our most difficult problem in writing the adventure was to keep it logical and realistic. There are no irrational traps and sudden senseless deaths in Derelict. This ship was designed to be perfectly safe for its' builders. It just happens to be deadly to alien invaders like you.

NUCLEAR SUB by Bob Retelle — You start at the bottom of the ocean in a wrecked Nuclear Sub. There is literally no way to go but up. Save the ship, raise her, or get out of her before she blows or start WWIII.

Editors note to players—This was actually plotted by Rodger Olsen, Bob Retelle, and someone you don't know — Three of the nastiest minds in adventure writing. It is devious, wicked, and kills you often. The TRS-80 Color version has nice sound and special effects.

EARTHQUAKE by Bob Anderson and Rodger Olsen — A second kids adventure. You are trapped in a shopping center during an earthquake. There is a way out, but you need help. To save yourself, you have to be a hero and save others first.

Authors note to players — This one feels good. Not only is it designed for the younger set (see note on Haunted House), but it also plays nicely. Instead of killing, you have to save lives to win this one. The player must help others first if he/she is to survive — I like that.

PYRAMID by Rodger Olsen — This is one of our toughest Adventures. Average time through the Pyramid is 50 to 70 hours. The old boys who built this Pyramid did not mean for it to be ransacked by people like you.

Authors note to players — This is a very entertaining and very tough adventure. I left clues everywhere but came up with some ingenous problems. This one has captivated people so much that I get calls daily from as far away as New Zealand and France from bleary eyed people who are stuck in the Pyramid and desperate for more clues.

QUEST by Bob Retelle and Rodger Olsen — THIS IS DIFFERENT FROM ALL THE OTHER GAMES OF ADVENTURE!!!! It is played on a computer generated map of Alesia. You lead a small band of adventurers on a mission to conquer the Citadel of Moorlock. You have to build an army and then arm and feed them by combat, bargaining, exploration of ruins and temples, and outright banditry. The game takes 2 to 5 hours to play and is different each time. The TRS-80 Color version has nice visual effects and sound. Not available on OSI. This is the most popular game we have ever published.

MARS by Rodger Olsen — Your ship crashed on the Red Planet and you have to get home. You will have to explore a Martian city, repair your ship and deal with possibly hostile aliens to get home again.

Authors note to players — This is highly recommended as a first adventure. It is in no way simple—playing time normally runs from 30 to 50 hours — but it is constructed in a more "open" manner to let you try out adventuring and get used to the game before you hit the really tough problems.

ADVENTURE WRITING/DEATHSHIP by Rodger Olsen — This is a data sheet showing how we do it. It is about 14 pages of detailed instructions how to write your own adventures. It contains the entire text of Deathship. Data sheet - $3.95. NOTE: Owners of OSI, TRS-80, TRS-80 Color, and Vic 20 computers can also get Deathship on tape for an additional $5.00.

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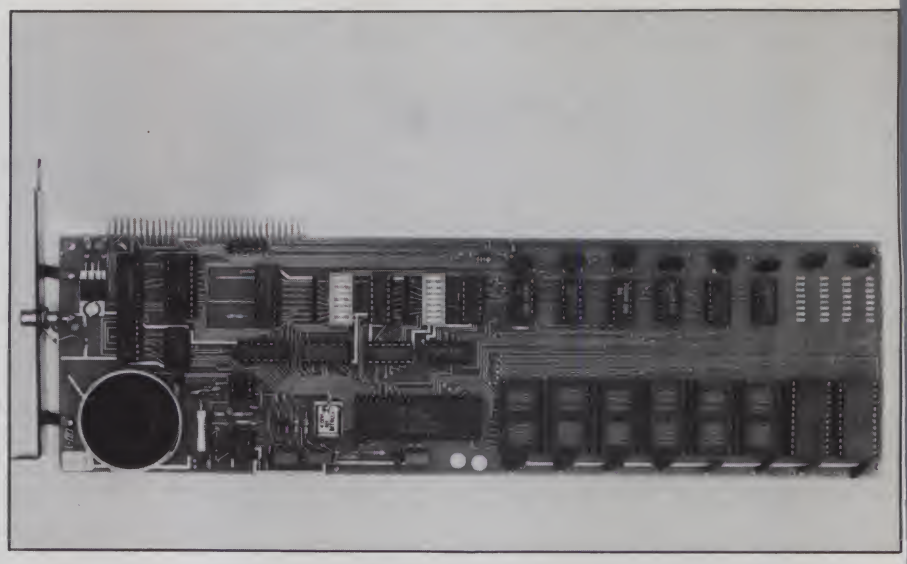

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```
10  REM PHONEME DEMONSTRATION
20  A=2816: REM BASE PORT ADDRESS
30  OUT A+3,8: REM ENABLE PHONEME CHIP
40  FOR N=0 TO 63: REM SAY ALL PHONEMES
50  OUT A+2,N: REM ADDRESS 2818
60  GOSUB 100: REM TEST FOR COMPLETION
70  NEXT N
80  END
100 S=INP(A+3): REM ASK FOR COMPLETION STATUS
110 IF S<128 THEN RETURN ELSE GOTO 100:REM DONE?
```

Listing 1. Basic phoneme demonstration program.

```
10  REM VOCABULARY DEMONSTRATION
20  A+2816: REM BASE PORT ADDRESS
30  OUT A+3,4: REM ENABLE DIGITALKER
40  FOR N=0 TO 143: REM SAY ALL VOCABULARY WORDS
50  OUT A, N: REM ADDRESS IS 2816
60  GOSUB 100: REM TEST FOR WORD COMPLETION
70  NEXT N
80  END
100 S=INP(A+3): REM ASK FOR COMPLETION STATUS
110 IF S< 128 THEN RETURN ELSE GOTO 100: REM DONE?
```

Listing 2. Basic vocabulary demonstration program.

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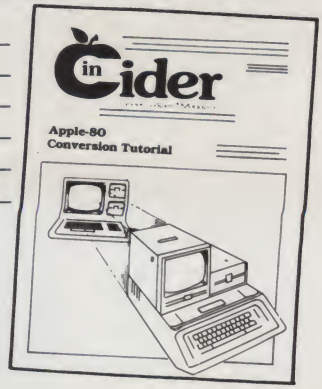

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Bridging the VIC-PET Communication Gap

You can overcome some minor incompatibilities between the systems to run VIC programs on the PET and vice versa.

By Ron Gunn

PETs and VICs will talk to each other quite handily, with few built-in gotchas to contend with. The Commodore folks have kept compatibility so close that the conclusion is inescapable: It was intentional.

Program Line Length

The PET has a maximum line length of 80 characters. You can enter longer lines, however, by using a keyboard question mark for screen prints and keyboard abbreviations for keyword commands.

What am I saying? Have you tried using L-shifted O for LOAD? It works. If you enter G-shifted O you will get a GOTO, either from the keyboard or when entering a program line. RIGHT$ enters as R-shifted I (using two spaces) and so on.

These entries are stored as keywords and print out in full when listed on the screen. The listed version may well be more than two PET lines long, but it's OK. The conclusion: The 80-character limit is an artifact of the screen editor. Once the line is in the machine, it lists and works normally, even if it shows up as more than two lines on the listing.

The only limitation is that you can't edit it; you must replace it if changes are to be made. The screen editor will accept only two lines and will drop any remainder on a third line into that great bit-bucket in the sky. If you know what is happening, this will rarely be an inconvenience.

What has this to do with the VIC? Well, the VIC, because of its 22-line screen format, is conditioned to accept four lines of code instead of the two that the PET will accept. A program line on the VIC is therefore 88 entered spaces instead of the 80 that the PET will accept. But, since the PET will show and use longer lines (though it may not edit them so well), you can read those long VIC lines into the PET.

The allowable abbreviations for keywords are discussed in the Osborne *PET/CBM Personal Computer Guide*, second edition, and are given in detail in the Commodore *VIC-20 Computer Guide* that comes with all current VIC machines. The second letter is shifted to enter the abbreviation with all Basic keywords except CLOSE, GOSUB, RESTORE, RETURN, STEP, LEFT$ or STR$, where the third letter is shifted to make the command unique. Therefore, between code written on either machine, program line length is not a problem.

Screen Line Length

Since the PET sports 40 screen spaces per line while the VIC has 22, there are some differences in screen printing. There is also a difference between the PET's 25 lines and the VIC's 23, but this is not as important as the other.

You will be able to take quick looks at VIC programs on the PET, and they will appear on the left side of the screen. But PET programs may require some modification of the screen print statements to avoid wrap-around and scrolling off on the VIC's smaller screen.

You will find planning edits from the screen simpler on the PET because it has twice the screen room. The editing is easier on the VIC because it automatically opens up space for the next screen line of a program line while editing, and because all of the keys including the cursor and delete keys repeat. Some of the keys are in different places or require shifts, and this will slow you down, but the editing and cursor control protocols are quite the same.

Where'd That Program Go?

PET and VIC programs can start at different points in memory. If you have read a VIC program into your PET, it may not run and it may not list. This is because the PET does not have the elaborate start-up routine that the VIC does.

The VIC takes a couple of seconds to look and see what is connected out there. A plugged-in memory expansion actually puts the program in a different place. A PET program starting at 1024 is put into the VIC where program memory starts, wherever that is.

The PET isn't quite so smart in that regard. It believes the file header and puts the program right where it was when it was recorded, and if you enter RUN and that program isn't at 1024, it returns a syntax error.

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Well, there are fortunately only three places where the VIC will put that program: at 4096, 1024 or 4608. If the program was recorded from a 5K (bare) VIC, it will be at 4096. If the larger memory is added, then it will be at 4608. In either of these cases, you must tell the poor, confused PET where to look. The first character the Basic interpreter sees must be a 0.

Try the PET pokes in Example 1 to see if the hidden VIC program becomes visible.

Location 41 stores the most significant hex digits pointing to the start of Basic text. The PET will look here to see where to find its program area. It is normally set at 4 (thus memory location 1024 (4×16×16)). Entering or poking in a 16 yields 4096 (16×16×16) and entering in an 18 gives it 4608 (18×16×16). If the Basic interpreter does not find a zero at the location specified here then it hiccups an error message for you to ponder (thus the zero poke shown in Example 1).

If recorded from	then
Bare VIC	POKE 41,16:POKE 4096,0
8K+ expansion	POKE 41,18:POKE 4608,0

Example 1.

If you put a PET program into a VIC, and then record it back out, it may be relocated on the file header. If you develop a program on the PET, try it on the VIC, edit it, re-record it and then put it back in the PET, it may be moved. Use the above information to find it again.

Subsequent PET saves will reflect the new location, since that is now where it is in memory; the PET won't move it back. You may need a larger PET, since the bottom of PET memory may well not be utilized on a transplanted VIC program.

There are two ways to get it to start again at 1024: Save it from a VIC that has the 3K memory expander installed, or, if you have a PET Toolkit, load it into the PET using APPEND instead of LOAD.

When you are through playing VIC with the PET, you must either turn it off or POKE 41,4 to tell it where to find PET programs again. It is a weird experience to list a program and start up in the middle of the whole thing. It positively won't run.

Editing

You begin to appreciate the fine points of the VIC upgrade when you run an elaborate sound and color VIC program on the PET. The PET does all that it can with the foreign code and does not blow up. Pokes to sound and color registers are simply ignored, and all of the Basic runs perfectly. It is not possible to test or even to enter the various color commands from the PET keyboard, since they don't exist, so you have to reserve that part of the checkout for the VIC itself.

The mysterious characters appear on the PET screen, but if you delete one, stuffing it back in may not be possible. A blue register key is simply not there to press to restore that reverse-back-arrow character!

Testing

It can be difficult to run VIC programs that use the function keys for responses, especially if you use the

single-character GET function. There is no PET keyboard equivalent to CHR$(133) through CHR$(140) returned by the VIC function keys.

In coping with this, first be aware that the function keys F1, F3, F5 and F7 return CHR$ 133, 134, 135 and 136 in that order. Shifted function keys F2, F4, F6 and F8 return 137, 138, 139 and 140.

The unshifted function keys return consecutive numbers. If there are not too many places to change, you might temporarily modify the response section of the program you are looking at to accept inputs of 1, 2, 3, 4.

For example, the line GET X$:A=(ASC(X$)−132) gets a character from the keyboard, derives its ASCII value, then subtracts a fixed amount from that ASCII value to derive a small number that can be used, for instance, in an ON GOSUB statement, to do different things.

This line returns values for A of 1, 2, 3, 4 for the four unshifted function keys. If you change this temporarily to GET X$:A=(ASC(X$)−48), the entry of 1, 2, 3, 4 would now also give values for A of 1, 2, 3, 4 without significant change to the program. The program would run essentially as is and could be converted back to function key input on either machine.

Summary

Let's sum up on VIC-PET communications: Despite different screen line lengths, the two computers do not have any compatibility problem with program line lengths. You do have to consider the difference between the 40-column or more PET and the 22-column VIC on screen prints.

You must inform the PET where in memory VIC programs might be, while the VIC will simply look for itself and make the necessary arrangements. The same excellent screen editor is in both machines, and you might have to substitute for use of VIC function keys if you put a program using them into a PET.

VIC owners can easily benefit from the convenient features built into many nearby PET systems, and PET users will be impressed by some of the new capabilities built into the smaller machine, like repeat-key, color and sound. While some incompatibilities are inevitable, they do not result in system crashes, and there is much that can be done on a fully configured PET system to help VIC programming along.■

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4	DAYYEAR	Day of year a particular date falls on
5	LEASEINT	Interest rate on lease
6	BREAKEVN	Breakeven analysis
7	DEPRSL	Straightline depreciation
8	DEPRSY	Sum of the digits depreciation
9	DEPRDB	Declining balance depreciation
10	DEPRDDB	Double declining balance depreciation
11	TAXDEP	Cash flow vs. depreciation tables
12	CHECK2	Prints NEBS checks along with daily register
13	CHECKBK1	Checkbook maintenance program
14	MORTGAGE/A	Mortgage amortization table
15	MULTMON	Computes time needed for money to double, triple, etc.
16	SALVAGE	Determines salvage value of an investment
17	RRVARIN	Rate of return on investment with variable inflows
18	RRCONST	Rate of return on investment with constant inflows
19	EFFECT	Effective interest rate of a loan
20	FVAL	Future value of an investment (compound interest)
21	PVAL	Present value of a future amount
22	LOANPAY	Amount of payment on a loan
23	REGWITH	Equal withdrawals from investment to leave 0 over
24	SIMPDISK	Simple discount analysis
25	DATEVAL	Equivalent & nonequivalent dated values for oblig.
26	ANNUDEF	Present value of deferred annuities
27	MARKUP	% Markup analysis for items
28	SINKFUND	Sinking fund amortization program
29	BONDVAL	Value of a bond
30	DEPLETE	Depletion analysis
31	BLACKSH	Black Scholes options analysis
32	STOCVAL1	Expected return on stock via discounts dividends
33	WARVAL	Value of a warrant
34	BONDVAL2	Value of a bond
35	EPSEST	Estimate of future earnings per share for company
36	BETAALPH	Computes alpha and beta variables for stock
37	SHARPE1	Portfolio selection model-i.e. what stocks to hold
38	OPTWRITE	Option writing computations
39	RTVAL	Value of a right
40	EXPVAL	Expected value analysis
41	BAYES	Bayesian decisions
42	VALPRINF	Value of perfect information
43	VALADINF	Value of additional information
44	UTILITY	Derives utility function
45	SIMPLEX	Linear programming solution by simplex method
46	TRANS	Transportation method for linear programming
47	EOQ	Economic order quantity inventory model
48	QUEUE1	Single server queueing (waiting line) model
49	CVP	Cost-volume-profit analysis
50	CONDPROF	Conditional profit tables
51	OPTLOSS	Opportunity loss tables
52	FQUOQ	Fixed quantity economic order quantity model
53	FQEOWSH	As above but with shortages permitted
54	FQEOQPB	As above but with quantity price breaks
55	QUEUECB	Cost-benefit waiting line analysis
56	NCFANAL	Net cash-flow analysis for simple investment
57	PROFIND	Profitability index of a project
58	CAP1	Cap. Asset Pr. Model analysis of project
59	WACC	Weighted average cost of capital
60	COMPBAL	True rate on loan with compensating bal. required
61	DISCBAL	True rate on discounted loan
62	MERGANAL	Merger analysis computations
63	FINRAT	Financial ratios for a firm
64	NPV	Net present value of project
65	PRINDLAS	Laspeyres price index
66	PRINDPA	Paasche price index
67	SEASIND	Constructs seasonal quantity indices for company
68	TIMETR	Time series analysis linear trend
69	TIMEMOV	Time series analysis moving average trend
70	FUPRINF	Future price estimation with inflation
71	MAILPAC	Mailing list system
72	LETWRT	Letter writing system-links with MAILPAC
73	SORT3	Sorts list of names
74	LABEL1	Shipping label maker
75	LABEL2	Name label maker
76	BUSBUD	DOME business bookkeeping system
77	TIMECLCK	Computes weeks total hours from timeclock info.
78	ACCTPAY	In memory accounts payable system-storage permitted
79	INVOICE	Generate invoice on screen and print on printer
80	INVENT2	In memory inventory control system
81	TELDIR	Computerized telephone directory
82	TIMUSAN	Time use analysis
83	ASSIGN	Use of assignment algorithm for optimal job assign.
84	ACCTREC	In memory accounts receivable system-storage ok
85	TERMSPAY	Compares 3 methods of repayment of loans
86	PAYNET	Computes gross pay required for given net
87	SELLPR	Computes selling price for given after tax amount
88	ARBCOMP	Arbitrage computations
89	DEPRSF	Sinking fund depreciation
90	UPSZONE	Finds UPS zones from zip code
91	ENVELOPE	Types envelope including return address
92	AUTOEXP	Automobile expense analysis
93	INSFILE	Insurance policy file
94	PAYROLL2	In memory payroll system
95	DILANAL	Dilution analysis
96	LOANAFFD	Loan amount a borrower can afford
97	RENTPRCH	Purchase price for rental property
98	SALELEAS	Sale-leaseback analysis
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How Video Displays Work

In the first of a two-part article, the author examines the method behind Z-80A/MC6845 video display characteristics.

By James M. Callaghan

Many commercial video display terminals use a Zilog Z-80A for the central processing unit (CPU) and a Motorola MC6845 for the video display controller. But nothing seems to have been written on this video circuit combination, perhaps because the two are not directly compatible.

This Z-80A/MC6845 video display terminal maximizes the best features of each, resulting in versatile video display.

The Z-80A and the Z-80 are essentially the same microprocessor, except for the Z-80A's increased throughput. The Z-80 can operate up to a maximum clocking frequency of 2.5 MHz and the Z-80A can operate up to a maximum clocking frequency of 4 MHz. The MC6845 CRT Controller (CRTC) provides a programmable interface to a raster-scan CRT display.

This article describes the Z80A/MC6845 video display characteristics, details the theory-of-operation and presents logic diagrams, schematic and example displays. This article is mainly intended to be a learning tool for those readers who feel they need to better understand how various integrated circuits and passive components can be combined to cause a computer-programmed video presentation in memory to appear on a video monitor.

Display Characteristics

I obtained the following display characteristics using a twelve-year-old Sears portable black/white television receiver with a home-built direct video interface:

- Programmable number of horizontal displayed characters and character rows.
- ASCII upper- and lowercase 5×7 and graphics 7×8 format using an 8×8 character dot matrix.
- Full cursor control including size, on, off or blink modes.

A learning tool for readers to better understand how a video display works.

- Interlace or noninterlace display modes.
- Light pen capability.
- 4K bytes video refresh memory which can also be used for CPU read or write operations and switch selectable anywhere in the 64K CPU memory area.
- Normal or reverse video modes.
- CRTC programmable using only two input/output (I/O) channels. Memory-mapped I/O and direct memory access (DMA) are not used.
- Scrolling modes.
- Hardware-generated wait states automatically inserted for CRTC operation with the 4 MHz Z-80A clock rate.
- Up to 24 programmable line scan spaces between character rows.
- CPU priority over CRTC in video refresh memory use.
- Intel 8275 CRT controller-like graphics using the Texas Instruments TMS 4710 ASCII and graphics character generator (line intersect, cross and corner graphic characters, in addition to other symbols, without additional character logic).

Design Considerations

I had to consider the complete circuit to be interfaced with the video circuitry and the type of screen display prior to starting a detailed design layout. I had earlier designed and built a Z-80A-based real-time priority interrupt computer with a power supply providing ±12 V and ±5 V. I designed a video display which would interface with my computer and provide maximum video flexibility. It had to be capable of simultaneous text and graphic displays with a software-controlled number of horizontal display characters and character rows.

I also wanted an 8×8 character dot pattern so that the alphanumeric and graphics information could easily be displayed together. The 8×8 dot pattern forced the use of normal uppercase ASCII characters and smaller lowercase characters instead of the standard lowercase descenders. This does not prevent a hard-copy device from printing descenders. The type of character generator selected determines the shape of the graphics and ASCII alphanumeric characters displayed.

I did not have an erasable program-

Address correspondence to James M. Callaghan, 5728 Albright Drive, Virginia Beach, VA 23464.

Emulates these terminals exactly.

IBM 3101
DEC VT100, VT52
Data General D200
ADDS Regent 20, 25, 40
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Videx Videoterm™
Vista Computer Vision 80™
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mable read only memory (EPROM) programmer when I designed the system, so I bought a programmed character generator ROM. The TMS 4710 character generator ROM gave me the desired ASCII characters and graphics, including those like the Intel 8275 CRT controller produces, in an 8×8 dot matrix block. The MC6845 CRTC gave me the software-controlled display character format I desired.

Once the CPU, CRTC and character generator were selected, I next had to decide on the type of shift register (S/R) circuit to use. The television screen character row presentation is generated by an electron beam turning on (dot) and off (blank) while scanning across the face of the CRT, in horizontal parallel lines starting at the top of the screen and going from left to right. Sixty display fields are formed every second. It takes two interlaced fields of 262½ scan lines each to form one complete 525 scan line frame picture. The electron beam is blanked off when traveling from the end of one horizontal line to the start of another (during horizontal blanking) and from the bottom of the screen to the top to start a new frame (during vertical blanking). The horizontal scan lines of one field fall midway between the horizontal lines of the other field, forming an interlaced raster scan. Interlace operation allows twice the amount of information to be displayed for a given video bandwidth. The horizontal TV scan frequency is approximately 15,750 Hz.

The CRTC synchronizes a video refresh memory address with the electron beam position on the display screen. For a given screen beam character position, a corresponding refresh memory address is sent out by the CRTC. This address selects a video refresh memory word cell, which sends a seven-bit ASCII character identification word to the character generator ROM. The most significant memory bit is used for reverse video.

The CRTC also sends a corresponding three-bit character row address to the character generator ROM. The seven-bit ASCII character identification word from the video refresh memory and the three-bit character row address from the CRTC produce a character generator ROM ten-bit address. This normally results in a five-bit ASCII or graphic character dot row word output, which is parallel loaded into the S/R.

The S/R input data line on both sides of the five-character generator input data lines are normally grounded. This results in a seven-bit dot character row being sent serially, one dot at a time, to the electron beam intensity circuit. A low (logic 0) turns the beam off (blank) and a high (logic 1) turns the beam on. The S/R's two grounded input data lines produce two blank dot spaces between the displayed characters. The video timing circuit causes the S/R to load a new character row during a blanking output period.

One horizontal ASCII character row is generated by its first scan line writing the top seven-dots of each character, including blanks. The second scan line writes the next lower seven-dots of each character across the row. This process continues until the first horizontal ASCII character row is displayed. One or two of the character-generator-addressed rows produces an all-zero word output to the character generator. This results in one or two blank scan lines between ASCII-displayed character rows for character row spacing. This process continues until the beam is at the bottom of the screen.

I couldn't use the single S/R circuit approach, because I wanted to use all dots in the 8×8 character matrix block for display purposes. The load pulse precludes one dot from being controlled in each character dot row. A circuit that does allow full use of all display row dot positions is a two-S/R concept. S/R A shifts out the current display eight-bit character dot row while shift register B is loading the next eight-bit character display dot row. S/R B starts shifting out its eight-bit display character dot row on the shift pulse following the eighth shift pulse of S/R A. This method results in each S/R alternating between loading during an eight-bit character dot row period and shifting out eight character row display dots during the next eight-bit dot period. It also provides more time for S/R loading.

To fully use this concept, the character generator must be capable of providing the S/R with a full eight-dot usable character word. The TMS 4710 character generator does not allow full 8×8 dot matrix usage, but it comes close. Data out, bit 8, is always blank.

The eight-dot character row gives great flexibility in graphics since all dots can be used for display purposes. This approach, however, is not recommended for users who desire to display over 100 characters per row for text purposes due to the high dot frequency required for shifting out dots from the S/R.

For example, for a given dot frequency, a seven-dot character row can display 64 horizontal characters, but an eight-dot character row can only display 56 characters. There are only 448 visible horizontal scan line dots available in this example. A 10 MHz dot clocking frequency can only display approximately 55 horizontal characters using the eight-dot character row, but a much higher dot frequency must be used for over 100 characters per row. The CRTC can only operate up to a character clocking frequency of 2.5 MHz. This makes the maximum dot frequency eight times that, or 20 MHz.

The resulting ASCII characters are hard to read due to their small size at this frequency, even in the interlace mode. There is no loss in graphics capability since all dots can be controlled. The designer must decide whether high density text or graphics has the greater priority before deciding on how many horizontal dots to design. I used a 12-year-old commercial TV receiver to obtain the display characters, and that disproved many article warnings on the use of interlace display without monitors using a special CRT phosphor coating. The MC6845-generated interlace display is excellent on a standard TV receiver. As mentioned earlier, the interlace mode effectively doubles the character density on the screen without any increase in signal bandwidth.

Display Timing

The video display timing circuit generates pulses for synchronous operations of the CRTC, two S/R's and the video control latch which stores the reverse video, blanking and sync signal information from S/R load time to data shift out and display time when the latched information is used. The heart of my timing circuit is a synchronous four-bit up counter which continuously counts from 0 to 15. Counter noise spike generation is eliminated by the use of a synchronous counter. The counter is driven by a simple inverter circuit crystal oscillator generated pulse (Q_o). The counter four output signals (Q_a–Q_d) are combined by logic gates to provide the necessary additional timing pulses.

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Fig. 1 shows the video display timing diagram with a schematic of the timing logic circuit. Oscillator pulse $\overline{Q_o}$ is inverted to produce $\overline{Q_o}$ which continuously clocks S/R's A and B on the low to high signal edge.

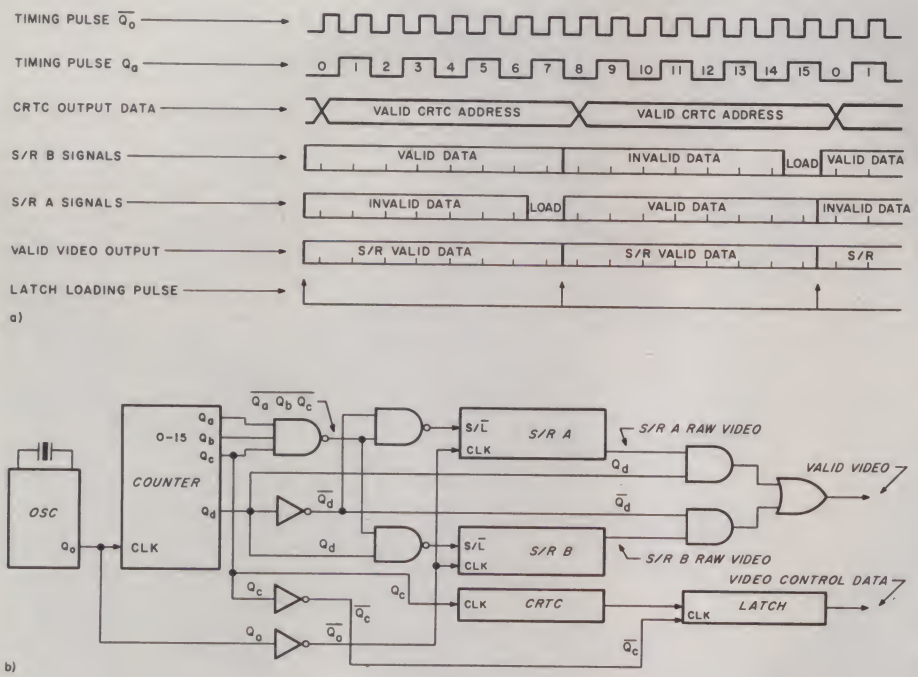

Fig. 1. Video display timing diagram and logic circuit. Fig. 1a shows how the shift register signals synchronize beginning with the oscillator pulse $\overline{Q_o}$. Counter output signals Q_bQ_c and Q_d are not shown. Fig. 1b shows the circuit logic used to operate the timing signals in Fig. 1a.

I use $\overline{Q_o}$ rather than Q_o for S/R clocking to provide an additional half oscillator pulse delay time for S/R data load setting prior to starting the shifting action. This becomes important when operating at higher dot oscillator frequencies. Loading pulse $\overline{Q_aQ_bQ_c}$ allows S/R's A and B to continuously shift out data except when S/R A loads on timing count 7 and S/R B loads data on count 15 (when $\overline{Q_aQ_bQ_c}$ is negative for S/R loading). One S/R's data loading does not affect the other S/R's shifting action. The S/R raw video output consists of eight bits of valid display data followed by zeros until the next eight-bit display word is output. Using this circuit, the S/R output is zero during loading.

Timing pulses Q_d and $\overline{Q_d}$ gate the $\overline{Q_aQ_bQ_c}$ load pulse to the two S/R's at the appropriate load time and gate the S/R valid data to the display circuit. The high portion of $\overline{Q_d}$ (timing count 0–7) enables timing pulse $\overline{Q_aQ_bQ_c}$ to load S/R A on timing count 7 while gating out the eight-dot character row bits from S/R B to the video output circuit on counts 0–7. The high portion of Q_d (timing count 8–15) enables timing

pulse $\overline{Q_aQ_bQ_c}$ to load S/R B on timing count 15 while gating out the eight-dot character row bits from S/R A to the video output circuit on counts 8–15. Loading pulse $\overline{Q_aQ_bQ_c}$ is gated to each S/R during the last pulse of its eight-count nondisplay data out period during loading and zero shifting actions. I chose this technique to allow maximum character data set-up time from S/R load to commence shift time.

CRTC Interface

The MC6845 CRTC provides the refresh memory and character generator row addresses, vertical and horizontal sync and cursor control signals. Light pen, hardware scrolling and interlace modes are also available for programming into the CRTC by the CPU. The CRTC will cause the refresh memory ASCII and graphics data to be displayed without further need of CPU action. Any additional CPU video action will only be necessary if an update is made to the data in refresh memory, scrolling, light pen or cursor modes or if change is made in display modes or format by programming action.

Video refresh memory is shared by the CPU and the CRTC with the CPU having access priority. Light pen action consists of cursor repositioning by internal CRTC circuitry reacting to an external light pen pulse input (active high) signal by latching a new cursor position address in the light pen register. The CPU then must, normally through interrupt action, read the light pen register's new cursor address and write it into the CRTC cursor high and low address registers. The cursor will then be positioned on the screen where the light

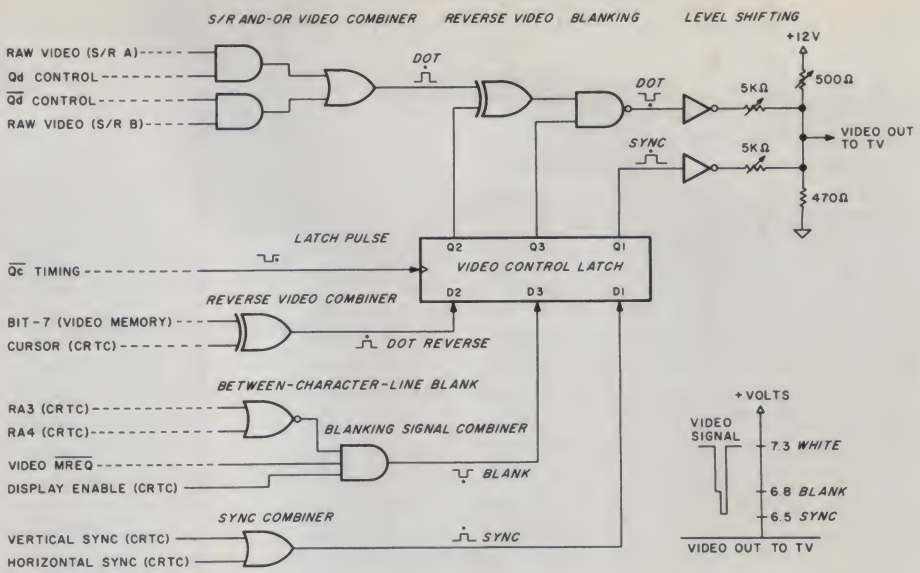

Fig. 2. Composite video logic circuit showing how the various timing, blanking and video signals are combined, stored and level-shifted for output to the TV monitor. The output video signal voltages are also shown.

pen signal was detected. This article will not cover light pen pulse generation circuits.

The CRTC, after programming and receiving character timing pulses, provides the video memory address data on output signal lines (MA0–MA13) in a numerical address sequence, which locates the relative positions of characters in video memory with their positions on the display screen. The CRTC concurrently provides the character generator row address data on output signal lines (RA0–RA4). Bits 0–6 of the video memory output word go to the character generator as part of the ROM address and bit 7 goes to the reverse video circuit, where it switches the video output character between normal (active low) and reverse video (active high).

Within a maximum access time of 450 nanoseconds (ns), my character generator has a stable eight-bit character dot row word at the output. This word is loaded into the appropriate S/R as determined by the timing circuit. Video memory output, bit 7, is latched into the video control latch by the low-to-high transition of timing pulse $\overline{Q_c}$. CRTC output cursor data (active high), vertical sync (active high), horizontal sync (active high) and CRT (active high) are all latched by the high-going edge of timing signal $\overline{Q_c}$. The next character clock signal (high portion of Q_c) sets the CRTC up for the next character set of CRT display control signals. The active transition of the CRTC clock input signal is from high to low.

Composite Video Generation

The composite video signal generation circuit combines the S/R output video pulses with the latched video control signals by logic gates. The signal is finally level-shifted to make it compatible with my TV monitor requirements for direct video interface display. A direct video interface display is used instead of radio frequency (rf) coupling when a wider TV bandpass is necessary for more horizontal characters to be displayed. The direct-coupled method bypasses most of the TV monitor band limiting circuits, such as the sound trap. The CRTC software program ensures that the composite signal correctly matches the input signal timing requirements of the TV. Fig. 2 shows the composite video logic circuit.

The usable display portions of the raw video output signals from each of the two S/R's are alternately selected by the high portion of timing signals Q_d and $\overline{Q_d}$, which control the two-wide, two-input, AND-OR gate input data selection. The resulting OR gate output signal is one continuous video dot signal (active high), which is the composition of the usable display portions of both S/R's with one eight-bit S/R word following the other.

Note that the two S/R output signal lines could be fed directly to an OR gate for video output since the display dot information theoretically is active-high only for valid display dots. I didn't do this since I had the AND-OR equivalent gates available and didn't want to worry about possible S/R noise pulse (active high) outputs during loading and zero shifting periods. An equivalent AND-OR logic circuit can be obtained by replacing the two AND gates and the OR gate with three NAND gates.

The AND-OR gate output signal is next mixed with the reverse video signal (Q_2) from the video control latch. The exclusive OR gate inverts the video signal (1 to 0 and 0 to 1) if

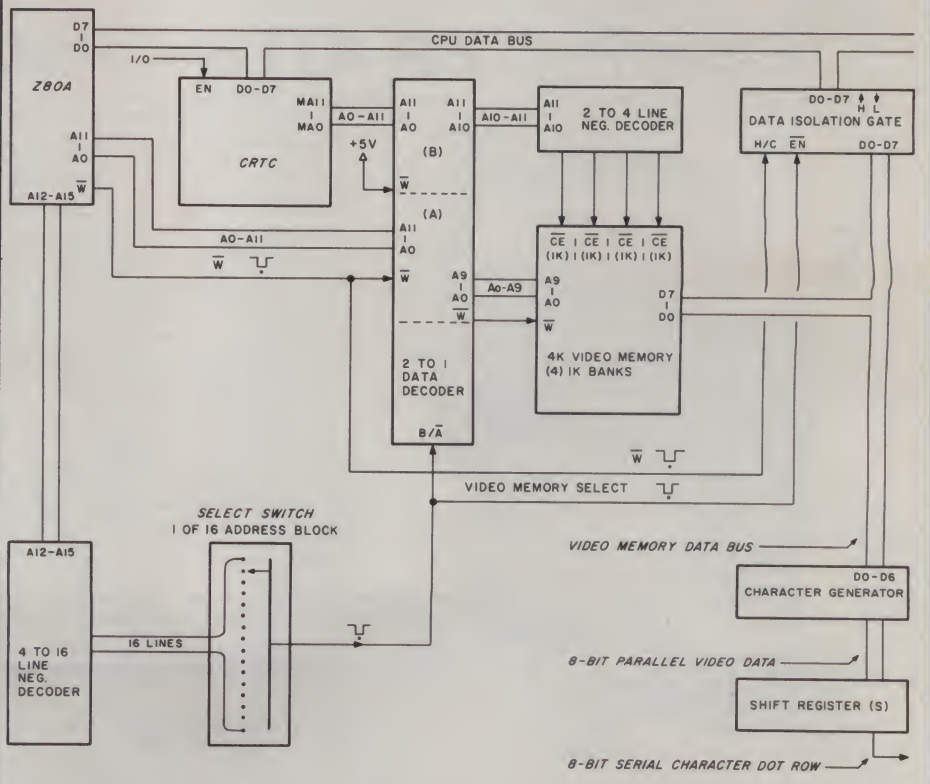

Fig. 3. Video memory control logic showing how the Z-80A and MC6845 signals are gated to access the video memory with the CPU having priority. The data isolation gate ensures that the Z-80A and its main memory (not shown) can communicate at the same time the MC6845 is communicating with the video memory. Note that video memory data line D7 does not go to the character generator. It goes to the reverse video gate, as shown in Fig. 2.

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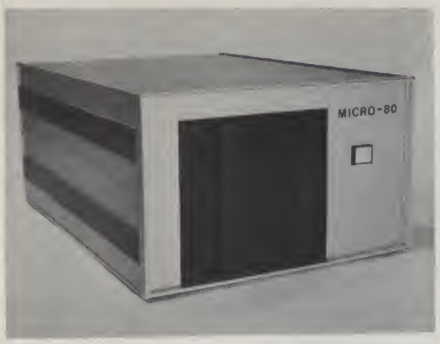

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the latch reverse video control signal is high. This results in the TV character matrix dots reversing their high or low condition by dots normally blank being displayed as white and dots normally white being displayed as blank. If the latch-reverse video control signal is low, the composite video passes through the exclusive-OR gate unaltered.

The last video gate prior to the signal level shifter circuit is a blanking NAND gate. This gate inhibits (blanks) the video output signal when the blanking control signal (Q_3) from the video control latch is low. The NAND gate is used to provide an active-high blanking signal to the video level shifter circuit.

The three input signals to the video control latch are reverse video (D_2), blanking (D_3) and sync (D_1). Video memory bit 7 causes the resulting display character to be reverse video (inverted if it is high and normal video if it is low). Video memory bit 7 and CRTC output cursor signals are combined in an exclusive-OR mixing gate, rather than an OR gate, so that the cursor will display against both a normal screen character and a reverse video screen character. The output of the mixing exclusive-OR gate goes to input signal pin (D_2) of the video control latch.

The video control latch input blanking signal (D_3) is generated by a three-input AND gate which combines the CRTC display enable, CPU video memory request ($\overline{MREQ}$) and the between-character-line blanking signal. If any of these three signals goes low, then the AND gate output will go low, causing video blanking as discussed above in the blanking gate operation. The between-character-line blanking NOR gate output is low if either CRTC character generator row address signal (RA3 or RA4) is high. This causes additional blanking lines between display character rows if the CRTC is programmed to address greater than eight character lines. For example, addressing 11 character lines will result in the eight character scan lines plus three blank scan lines between character rows.

CRTC horizontal and vertical sync output signals (active high) are combined in the sync-combining OR gate, with the output going to the video control latch signal input (D_1). If either CRTC-generated sync signal is high, the OR gate output signal is also high.

The video $\overline{MREQ}$ signal is active low when the CPU is accessing video memory in a read or write action. This blanking signal goes to the video control latch for delayed blanking rather than directly to the blanking AND gate. This is because the character dot row being displayed when the CPU generates the $\overline{MREQ}$ signal was loaded in the S/R one character row earlier, and thus could not be affected even if the CPU assessed the display character video memory location.

The level shifter is a combination of resistors and two open-circuit inverter gates connected to a +12 V supply. Open-circuit gates are necessary for signal voltages over +5 V. My TV display monitor requires a positive video signal which goes from 6.5 V (sync) to 7.3 V (white), with 6.8 V resulting in a blank. If both inverter gate inputs are low, then the composite video output is set at a positive high 7.3 V level set by the 470 Ω and variable 500Ω resistor voltage divider combination. When the video inverter input signal is high, the gate output pulls the composite video output signal level down to a low 6.8 V blank level set by the variable 500 Ω with the corresponding variable 5k Ω resistor voltage divider combination. When the sync inverter gate input signal is high, the gate output signal pulls the composite video down to a low 6.5 V sync level set by the variables 500 Ω with the corresponding 5k Ω resistor voltage divider combination.

If the input signals to both inverter gates are high, both outputs are low, placing both variables 5k Ω resistors in parallel and causing the video output level to the TV display monitor to be less than the required 6.5 V sync level. If this should cause a problem, the video inverter gate could be additionally gated such that when an active high signal is present with the sync inverter input, then an active high signal is inhibited from the video inverter gate input.

Video Memory Control

My video memory can be addressed by either the Z-80A CPU or the MC6845 CRTC, with the CPU having priority. Fig. 3 shows the video memory connect logic. The CRTC data signal lines connect directly to the CPU data bus since the CRTC data lines are only used by the CPU either to write to the CRTC internal registers (program) or to read from the CRTC the internal registers' cur-

sor and light pen stored addresses. CRTC register programming and load action is done through CPU-controlled circuitry described later in this article. The character generator data input lines are connected to the video memory data lines. This is no problem during CPU and video memory communications, because the video output is blocked by the video blanking gate described earlier.

CPU data communications with the video memory is done by the video memory select signal going low, which enables the data isolation gate to pass data signals. The low video memory select signal also directs the CPU address and R/$\overline{W}$ (active high READ and active low WRITE) control lines to the video memory by the 2-to-1 line data selector gates. When the CPU is not communicating with the video memory, then the video memory select signal is high, which tri-states (high impedance outputs) the data isolation gate, disabling the data flow between video memory and the CPU data bus. The video memory select high signal also causes the 2-to-1 line data selector gates (four) to switch CRTC address data output to the video memory inputs when its $\overline{RD}$ (active low READ) control line is enabled.

My video memory contains 4K (4096) words which are enabled in 1K (1024) word blanks. The upper four CPU address lines (A12–A15) are decoded to 16 4K memory block areas. The video memory select signal is produced by decoding the upper four CPU address lines into one of 16 lines going low by the 1-to-16 line negative decoder (74LS154). Setting one of the 16 select switches connects the video memory select signal line to one of the 16 negative decoder output lines. Only one switch is set at a time. When the CPU addresses this portion of memory the video memory select signal line goes low, which enables video memory.

The desired 1K bank section of the 4K video memory is enabled by the BCD-to-10 line negative decoder (74LS42), which decodes address lines (A10–A11) from the CPU or CRTC through the 2-to-1 line data selectors (74LS157). Address lines (A0–A9) select the one desired word of the enabled 1K video memory bank, which the CPU or CRTC will be communicating with.

Next month I will continue the discussion on the theory of operation and examine how to program the CRTC. ■

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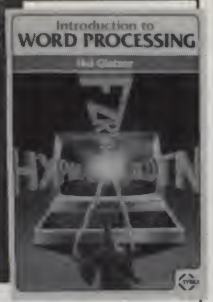

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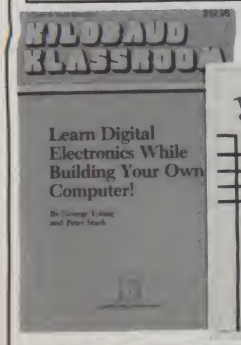

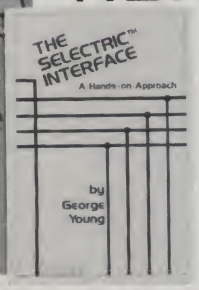

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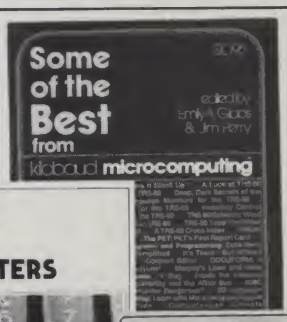

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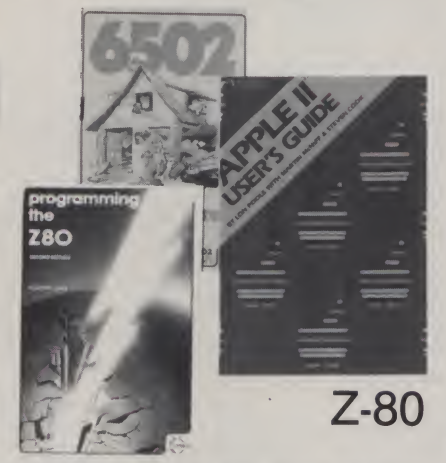

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6502

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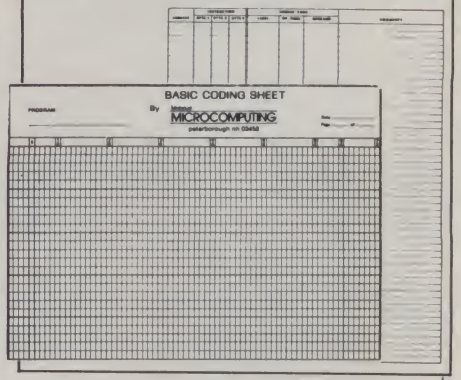

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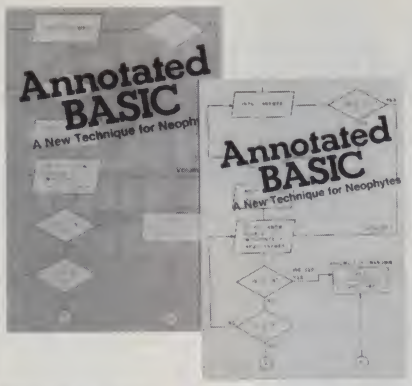

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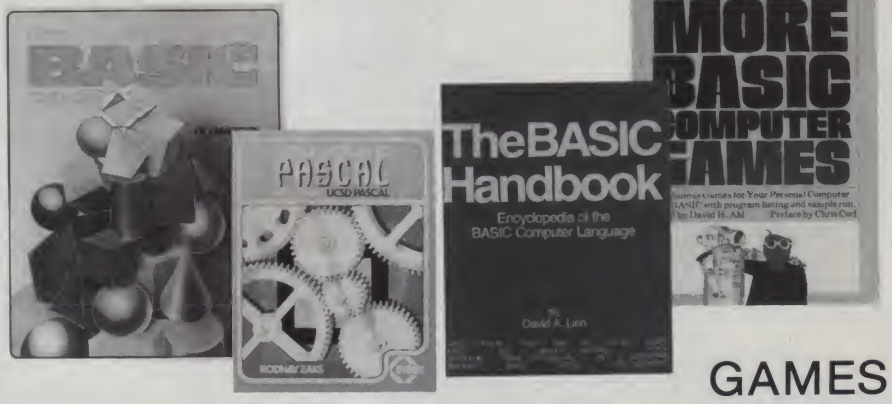

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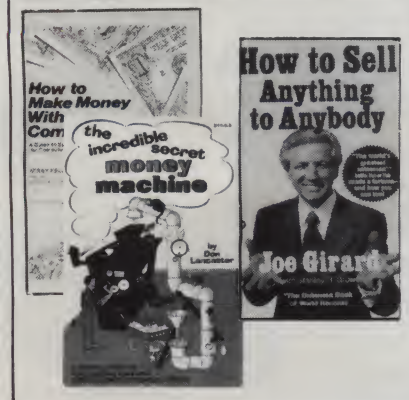

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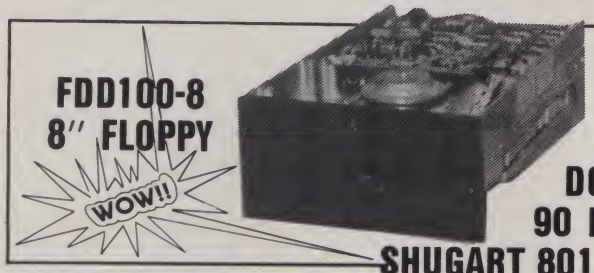

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90 DAY WARRANTY
SHUGART 801R COMPATIBLE

DUAL 8" SUBSYSTEM

KACCS2422A	Controller w/CP/M 2.2	1	$395.00
KASIEFDD1008	8" Drive	2	$550.00
IN A DUAL HORIZONTAL CABINET WITH POWER SUPPLY			$395.00
AND DATA CABLE		1	$ 35.00
SAVE $380.00			$1375.00
			KAPOBSIESUB1

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Same as above, with CCS2810 Z80 4MHz CPU and CCS 2065 64K Dynamic RAM:
$1390.00
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$275.00	1
$259.00	2-9
$225.00	10+

KASIEFD01008
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BEST $ VALUE!!
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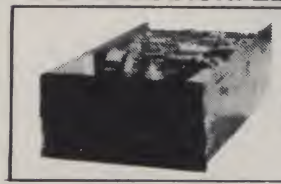

Better Than QUME! Better Than SHUGART!

8" Double-sided, double-density, interchangeable with QUME & Shugart

KAMITM289463	Shipping Weight 16 lbs.	$450.00
KAMITM289463M	Manual	$ 10.00

2 or More $435.00 each

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DUAL 8" FLOPPY DRIVE CABINET

FEATURES:
- Positive pressure forced air cooling for reliable disk drive operation
- AC input via 3 wire 7 foot international cord/socket set
- AC input EMI filtered to six amps to help prevent disk crashes due to power spikes and line noise
- 14 gauge main chassis
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- Double-sided custom PC power board and supply
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TWO MITSUBISHI 8" DRIVES AND CABINET TOGETHER!!

DRIVES AND CABINET SHIPPED SEPARATELY

$1150.00

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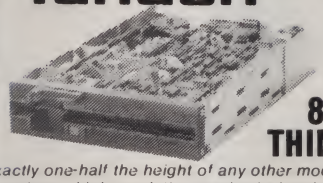

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Proprietary, high-resolution, read-write heads patented by Tandon
D.C. only operation - no A.C. required
Industry standard interface
Three milisecond track-to-track access time (9 lbs.)

KATNOTM8481	*Single Sided*	$380.00	2 or more	$370.00 ea
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KATNOTM1001	*Single Sided, 250KB (5 lbs.)*	$220.00 ea
	2 or More $200.00 ea.	
KATNOTM1002	*Double Sided, 500KB*	$295.00 ea.
	2 or More $270.00 ea.	
KATNOTM1003	*Single Sided, 500KB*	$295.00 ea.
	2 or More $270.00 ea.	
KATNOTM1004	*Double Sided, 1000KB*	$395.00 ea.
	2 or More $375.00 ea.	

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- Fan Cooled
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KAJMRTLC Cabinet & Power Supply List $200.00 **$180.00**
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Includes Power Cables

International Instrumentation Incorporated

- Positive Pressure Filter Cooling
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- Each output is individually fused
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Temperature and voltage monitor with visual and audible alarm for overtemp condition. Direct Digital Readout of internal temperature in C on standard OVM

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KATLV910	With emulations & foreign languages	$609.00
KATLV910BLK	Black mode version of above	$609.00

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- Low profile detached keyboard features sculptured keys with matte finish
- Screen tilts and swivels
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- 7 x 9 dot matrix with full decenders
- RS-232 Serial interface w/auxillary RS-232 port
- 128 Character ASCII set and 31 character line drawing set

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KAVSL50GR	P31 green display	$750.00	$685.00

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JMR

SINGLE	DOUBLE
5V@1A 12V@1.5A	5V@2A 12V@3A
Shipping weight 5 lbs	*Shipping weight 9 lbs*

KAJMR1C5	Single 5¼" Drive Cabinet	$79.00
KAJMR2C5	Dual 5¼" Drive Cabinet	$99.00

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KAJMR2C5C With Internal Data Cable **$115.00**

Circle 277 on Reader Service card.

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SOFT SECTOR
40 TRACK SINGLE SIDED
DOUBLE DENSITY WITH
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PACKAGE OF 10 **$19.95**

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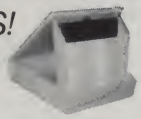

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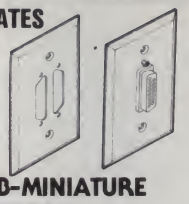
A $4.25 VALUE!! **BLPR15SD0** *(Shipping Weight 2 lbs.)*

KAPR1580 *package of 80 less Library Case* **$120.00**

EIA/RS232 WALL PLATES

(Does not include connectors)



KAIIIWP0B251 Single punched
4/$10.00

KAIIIWP0B252 Dual Punched
4/$12.00

RS232 "D" SUB-MINIATURE CONNECTORS

		1-9	10-24	25-99
KACNDDA25P	*25 Pin Male*	**$3.00**	**$2.75**	**$2.25**
KACN00A25S	*25 Pin Female*	**$4.00**	**$3.75**	**$3.00**
KACNDDB51212	1 Pc. Grey Hood	**$1.6D**	**$1.45**	**$1.3D**
KACNDD25H	2 c. Grey Hood	**$1.5D**	**$1.25**	**$1.1D**
KACNDDB51226	2 Pc. Black Hood	**$1.9D**	**$1.65**	**$1.45**

1200 BAUD MODEM FOR ONLY $495.00!

AUTO DIAL 212A MODEM

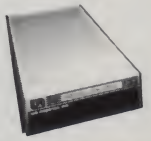
The **AUTD DIAL 212A** Modem is a direct connect 0-300 or 1200 baud modem capable of dialing and calling for you. **The AUTD DIAL 212A is compatible in function to the DC Hayes SMARTMODEM™.**

Part No.	Description	List Price	SALE Price
KAUSRADIAL212A	0-300, 1200 baud dialing modem	$599.00	**$495.00**

ACCOUSTIC MODEM

The **PHONE LINK** Modem is a 300 baud RS232 compatible acoustic modem capable of operating as either an answer or originate modem. It is BELL 103/113 compatible and will accept most standard phone handsets.

KAUSRPLNK 0-300 Baud accoustic modem $149.00 **$129.00**



MICRO LINK DIRECT CONNECT MODEMS

The **MICRD LINK** Modems are available in either 0-300 or 1200 baud transmission rates and both are RS232 compatible. Operation can be answer or originate.

KAUSRMLNK300	0-300 baud direct connect	$179.00	**$159.00**
KAUSRMLNK1200	1200 baud direct connect	$449.00	**$399.00**

AUTO LINK DIRECT CONNECT AUTO ANSWER MODEMS

The **AUTD LINK** Modems are auto answer modems capable of operating at 0-300 baud or 1200 baud transmission rates. The **AUTO LINK** Modems can be operated in either answer or originate modes.

KAUSRALNK30D	0-300 baud auto/direct connect	$219.00	**$195.00**
KAUSRALNK12D0	1200 baud auto/direct connect	$499.00	**$449.00**
KAUSRALNK212A	0-300, 1200 baud auto/direct	$549.00	**$495.00**

Specs	USRAD1AL212A	USRALNK212A	USRALNK1200	USRMLNK1200	USRALNK300	USRMLNK300	USRPLNK
1200 Baud	X	X	X	X			
D-300 Baud	X	X			X	X	X
Auto Dial (Hayes Smartmodem compatible)	X						
Auto Answer	X	X	X		X		
Auto Mode Select	X				X	X	
DTR Override	X	X	X	X	X	X	
RS232 pins 2&3 reversible	X	X	X	X	X	X	
LED Indicators:	X	X	X	X	X	X	X
Carrier Detect	X	X	X	X	X	X	X
Analog Loopback/ Self Test	X	X	X	X	X	X	X
Send Data	X	X	X	X	X	X	X
Receive Data	X	X	X	X	X	X	X
Terminal Ready	X	X	X		X		
Off Hook	X	X	X		X		
Answer Mode	X	X	X		X		
Ring Indicate			X		X		
High Speed	X	X					

California Computer Systems S-100 STARTER SYSTEM

We've bundled our most popular 3 board combination to form a complete S-100 System, just add mainframe, peripherals and cables! KAPDBCCSSP1

CCS2810 4MHz Z80 CPU

- 2/4 MHz CPU
- On board RS-232 Serial port
- On board Monitor

$695.00*
LIST PRICE: $1125.00
SAVE $430.00!!
(Shipping Weight 8 lbs.)

*With the purchase of two disk drives **$750.00** if purchased separately

CCS2422 DISK CONTROLLER

- Contols 4, 8" or 5¼" drives
- IBM 3740 Standard
- Supports single or double density
- Supports single or double sided
- Plug compatible with Shugart, Mitsubishi, MPI, Qume, Tandon, and Siemens

CCS2065 64K 4MHz RAM

- 4116 Low power dynamic RAMs
- Supports DMA
- Bank Select up to 512K
- Fail Safe refresh circuitry

ALL BOARDS ASSEMBLED & TESTED - PLUG & RUN!!

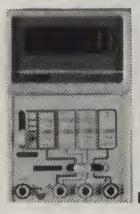
B&K PRECISION DMM 3½-Digit 5 Function

- 200 mV AC/DC voltage ranges
- 200 μA to 10A AC/DC current ranges
- Auto zeroing; auto polarity
- 10 megohm input impedance
- Completely overload protected
- Overrange indication of all ranges
- High-energy fuse for added safety
- Complete with test leads and carrying case

KAP28D5 List: $100.00

SALE: $88.00

B&K PRECISION DMM 3½-Digit Portable



- High-contrast liquid-crystal display
- Auto zeroing; auto polarity
- 10 megohm input impedance
- DC accuracy 1% typical
- Fully overload protected
- High-energy fuse for added safety
- Complete with test leads and carrying case

KAP28D1 List: $65.00

SALE: $58.00

FLUKE PORTABLE DMMs

KAFLU8060A	4½ Digits w/Freq Meter	**$349.00**
KAFLU8062A	4½ Digit - Tru RMS	**$279.00**
KAFLU8024B	3½ Digit "Investigator"	**$249.00**
KAFLU8020B	3½ Digit "Analyst"	**$194.00**
KAFLU8021B	3½ Digit "Troubleshooter"	**$159.00**

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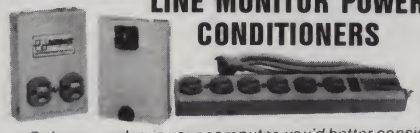

Before you plug in your computer, you'd better consider how you are going to insure or protect your investment from unwanted electrical pollution.

DG115 SERIES
SINGLE STAGE SPIKE PROTECTION

Part No.	Description	Wt.	List	1-9	10-24
KAWBRDG115P	Wall unit plug in	2 lbs.	$49.95	**$39.95**	**$34.95**
KAWBRDG115S	6 outlet strip w/SW&LT	3	$61.95	**$49.95**	**$42.00**

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3 STAGE SPIKE FILTER AND FOUR STAGE NOISE FILTER

KAWBRDG315P	Wall unit plug in	2 lbs.	$153.95	**$119.95**	**$ 99.95**
KAWBRDG315S	6 outlet strip w/SW&LT	3 lb	$193.95	**$149.95**	**$119.95**
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$599.00

KASCMTP121D (Serial)
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- 12 CPS • 10 CPI • 6 LPI • SERIAL OR PARALLEL INTERFACE
- 50-19.2K Baud • Friction Feed • 88 Character

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Circle 277 on Reader Service card.

Free CP/M 3.0* !!!

S-100 CPU Boards

8086/8087 - CompuPro

16 bit, 8 or 10 MHz 8086 CPU with provisions for 8087 & 80130.

CPU-70520A *8 MHz 8086 A & T* **$624.95**
CPU-70520C *8 MHz 8086 CSC* **$764.95**
CPU-70530A *with 8087 A & T* **$1224.95**
CPU-70530C *with 8087 CSC* **$1455.95**

8085/8088 - CompuPro

Both 8 & 16 bit CPUs, standard 8 bit S-100 bus, up to 8 MHz, accesses 16 Megabytes of memory.

CPU-20510A *6 MHz A & T* **$398.95**
CPU-20510C *6/8 MHz CSC* **$497.95**

CPU-Z - CompuPro

2/4 MHz Z80A CPU, 24 bit addressing.

CPU-30500A *2/4 MHz A & T* **$279.95**
CPU-30500C *3/6 MHz CSC* **$374.95**

SBC-200 - SD Systems

4 MHz Z-80A CPU with serial & parallel I/O, 1K RAM, 8K ROM space, monitor PROM included.

CPC-30200A *A & T* **$329.95**

THE BIG Z - Jade

2 or 4 MHz switchable Z-80 CPU board with serial I/O, accomodates 2708, 2716, or 2732 EPROM, baud rates from 75 to 9600.

CPU-30201B *Bare board w/manual* **$35.00**
CPU-30201K *Kit with manual* **$149.95**
CPU-30210A *A & T with manual* **$199.95**

CB-2 - SSM Microcomputer

2 or 4 MHz Z-80 CPU board with provision for up to 8K of ROM or 4K of RAM on board, extended addressing, IEEE S-100, front panel compatible.

CPU-30300K *Kit with manual* **$229.95**
CPU-30300A *A & T with manual* **$274.95**

2810 Z-80 CPU - C.C.S.

2 or 4 MHZ Z-80 CPU with serial I/O port & on-board monitor PROM, front panel compatible.

CPU-30400A *A & T with PROM* **$289.95**

2820 Z-80 DMA CPU - C.C.S.

4 MHz Z-80 CPU board with 2 serial I/O ports & Centronics parallel I/O port, separate data & status ports, DMA daisy chain compatible.

CPU-30420A *A & T with manual* **$569.95**

S-100 Disk Controllers

DISK 1 - CompuPro

8" or 5¼" DMA disk controller, single or double density, single or double sided, 10 MHz.

IOD-1810A *A & T* **$449.95**
IOD-1810C *CSC* **$554.95**
SFC-52506580F *8" CP/M 2.2 for Z-80* **$174.95**
SFC-52506586F *8" CP/M 2.2 for 8086* **$299.95**
SFO-54158000F *Oasis single user* **$499.95**
SFO-54158002F *Oasis multi-user* **$849.95**

VERSAFLOPPY II - SD Systems

Double density disk controller for any combination of 5¼" and 8" single or double sided, analog phase-locked loop data separator, vectored interrupts, CP/M 2.2 & Oasis compatible, control/diagnostic software PROM included.

IOD-1160A *A & T with PROM* **$359.95**
SFC-55009047F *CP/M 2.2 with VF II* **$99.95**

2242 DISK CONTROLLER - C.C.S.

5¼" or 8" double density disk controller with on-board boot loader ROM, free CP/M 2.2 & manual set.

IOD-1300A *A & T with CP/M 2.2* **$399.95**

DOUBLE D - Jade

High reliablity double density disk controller with on-board Z-80A, auxiliary printer port, IEEE S-100, can function in multi-user interrupt driven bus.

IOD-1200B *Bare board & hdwr man* **$59.95**
IOD-1200K *Kit w/hdwr & sftwr man* **$299.95**
IOD-1200A *A & T w/hdwr & sftwr man* **$325.95**
SFC-59002001F *CP/M 2.2 with Double D* **$99.95**

S-100 Memory Boards

256K RAMDISK - SD Systems

ExpandoRAM III expandable from 64K to 256K using 64K x 1 RAM chips, compatible with CP/M, MP/M, Oasis, Cromemco, & most other Z-80 based systems, functions as ultra-high speed disk drive when used with optional RAMDISK software.

MEM-65064A *64K A & T* **$474.95**
MEM-65128A *128K A & T* **$574.95**
MEM-65192A *192K A & T* **$674.95**
MEM-65256A *256K A & T* **$774.95**
SFC-55009000F *RAMDISK sftwr CP/M 2.2* **$44.95**
SFC-55009000F *RAMDISK with EXRAM III* **$24.95**

128K RAM 21 - CompuPro

128K x 8 bit or 64K x 16 bit static RAM board, 12 MHz, 24 bit addressing.

MEM-12810A *A & T* **$1609.95**
MEM-12810C *CSC* **$1794.95**

64K RAM 17 - CompuPro

64K CMOS static RAM board, 10 MHz, low power less than 4 watts, DMA compatible, 24 bit addressing.

MEM-64180A *64K A & T* **$549.95**
MEM-64180C *64K CSC* **$698.95**

64K RAM 16 - CompuPro

32K x 16 bit or 64K x 8 bit low power static RAM board, 10 MHz, 24 bit addressing.

MEM-32180A *RAM 16 A & T* **$598.95**
MEM-32180C *RAM 16 CSC* **$698.95**

64K STATIC RAM - SSM

IEEE 696/S-100 standard, up to 6MHz/8 Bit, 12MHz/16 Bit, 24 Bit extended addressing, disable-able in 2K increments

MEM-64300A *A & T* **$499.95**

64K STATIC RAM - Mem Merchant

64K static S-100 RAM card, 4 to 16K banks up to 8 MHz.

MEM-64400A *64K A & T* **$499.95**

64K STATIC RAM - Jade

Uses new 2K x 8 static RAMs, fully supports IEEE 696 24 bit extended addressing, 200ns RAMs, lower 32K or entire board phantomable, 2716 EPROMs may be subbed for RAMs, any 2K segment of upper 8K may be disabled, low power typically less than 500ma.

MEM-99152B *Bare board* **$49.95**
MEM-99152K *Kit less RAM* **$99.95**
MEM-32152K *32K kit* **$199.95**
MEM-56152K *56K kit* **$289.95**
MEM-64152K *64K kit* **$299.95**
Assembled & Tested ..... **add $50.00**

2066 64K RAM - C.C.S.

64K RAM board with bank and block select switching functions for Cromemeco Cromix & Alpha Micro.

MEM-64566A *64K A & T* **$424.95**

64K EXPANDORAM II - SD Systems

Expandable RAM board from 16K to 64K using 4116 RAM chips.

MEM-16630A *16K A & T* **$344.95**
MEM-32631A *32K A & T* **$364.95**
MEM-48632A *48K A & T* **$384.95**
MEM-64633A *64K A & T* **$399.95**

MEMORY BANK - Jade

4 MHz S-100 bank selectable expandable to 64K.

MEM-99730B *Bare board w/manual* **$49.95**
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MEM-32731K *32K kit* **$199.95**
MEM-64733K *64K kit* **$249.95**
Assembled & Tested ..... **add $50.00**

16K STATIC RAM - Mem Merchant

4MHz lo-power static RAM board, IEEE S-100, bank selectable, addressable in 4K blocks, disable-able in 1K segments extended addressing.

MEM-16171A *16K A & T* **$149.95**

Free CP/M 3.0 Offer

THREE BOARD SET - SD Systems

S-100 board set with 4 MHz Z-80A, 64K of RAM expandable to 256K, serial and parallel I/O ports, double-density disk controller for 5¼" and 8" disk drives, new and improved CP/M 3.0 manual set, system monitor, control and diagnostic software. Includes SD Systems SBC-200, 64K ExpandoRAM III, Versafloppy II, and FREE CP/M 3.0 - all boards are assembled & tested.

64K Board Set with FREE CP/M 3.0 ..... **$1195.00**
256K Board Set with FREE CP/M 3.0 ..... **$1395.00**

S-100 I/O Boards

SYSTEM SUPPORT 1 - CompuPro

Real time clock, three 16 bit interval timers, dual interrupt controllers(15 levels), up to 4K EPROM/RAM, RS-232C serial channel, provision for 9511A/9512 math chip.

IOX-1850A *SS1 A & T* **$359.95**
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IOX-1855A *with 9511 A & T* **$554.95**
IOX-1855C *with 9511 CSC* **$654.95**
IOX-1860A *with 9512 A & T* **$554.95**
IOX-1860C *with 9512 CSC* **$654.95**

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2 serial I/O ports 50-19.2K baud.

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INTERFACER 3 - CompuPro

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IOI-1838C *8 port CSC* **$749.95**

INTERFACER 4 - CompuPro

3 serial, 1 parallel, 1 Centronics parallel.

IOI-1840A *A & T* **$314.95**
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Multi-user I/O multiplexer & interrupt controller with on-board 8085A-2 CPU & 4K or 16K of RAM.

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Eight software programmable serial I/O ports, 110 -19.2K Baud, ideal for multi-user systems

IOI-1018A *A & T* **$469.95**

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Two serial & 3 parallel I/O ports, 110-19.2K Baud

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IOI-1010K *Kit with manual* **$179.95**
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Four RS-232C serial I/O ports with full handshaking.

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Circle 48 on Reader Service card.

Disk Drive for Apple $289.95

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IOM-5400A *Smartmodem* **$224.95**
IOK-1500A *Hayes Chronograph* **$218.95**
IOM-2010A *Micromodem II* **$328.95**
IOM-2012A *Terminal program for MMII* **$89.95**
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APPLE-CAT - Novation
Software selectable 1200 or 300 Baud, direct connect, auto-answer/auto-dial,touch & pulse dialing, auxiliary 3-wire RS-232C serial port for printer
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1200 and 300 baud, all the features of the standard Smartmodem plus 1200 baud, 212 compatible, full or half duplex.
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1200 BAUD AUTO CAT - Novation
212 Auto Cat, 1200 & 300 baud, auto dial/answer/disconnect, LED readout displays mode, analog/digital loop-back self tests, usable with multi-line phones.
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VDC-651212 *Color monitor* **$389.95**
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18 MHz RGB & composite video color monitors.
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VDX-420090 *RGB card for Apple* **$149.95**

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Reasonably priced color video monitors.
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Inexpensive erasers for industry or home.
XME-3100A *Spectronics w/o timer* **$69.50**
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NEW CP/M 3.0 - Digital Research
CP/M 3.0 is Digital Research's latest version of the industry standard disk operating system. It features many performance improvements such as intelligent record buffering, improved directory handling, "HELP" facility, time/date stamping of files and many more improvements. AND A TREMENDOUS INCREASE IN SPEED !!!, it is fully CP/M 2.2 compatible and requires no changes to your existing application software. Available only to Versafloppy II owners with SBC-200 CPU's
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SFC-55009057D *CP/M 3.0 manual set* **$30.00**

Apple II Accessories

APPLE DISK DRIVE - Fourth Dimension
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16K RAM CARD - for Apple II
Expand your Apple II to 64K, use as language card, full 1 year warranty. Why spend $175.00 ?
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New from Vista Computer, single or double sided, single or double density, compatible with DOS 3.2/3.3, Pascal, & CP/M 2.2, Shugart & Qume compatible
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2 MEGABYTES for Apple II
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80 column x 24 line video card for Apple II, 128 ASCII characters, upper and lower case, 9 x 10 dot matrix with 3 dot descenders, standard data media terminal control codes, CP/M Pascal & Fortran compatible, 50/60 Hz
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Complete Z-80 microcomputer with RAM, ROM, keyboard, display, kludge area, manual, & workbook.
CPS-30100K *Kit with workbook* **$29**
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CPK-50165A *1K AIM-65* **$42**
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S-100 EPROM Boards

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2708, 2716, 2732 EPROM programmer with software
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Full-function color graphics board, up to 8 colors, 256 x graphics, parallel I/O port, 8K RAM.
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Silent, simple, and on sale - a better motherboard
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MBS-121K *Kit* ..... **$69.**
MBS-121A *A & T* ..... **$109.**
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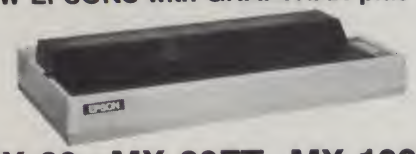

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Microline 83A *132/232 column, 120 CPS, forms up to 15" wide, removable tractor, plus all the features of the 82A.*

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PRA-27082 *Apple cable* **$19.95**
PRA-27087 *TRS-80 cable* **$24.95**
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PRA-43082 *Hi-res graphics ROMs 82A* **$49.95**
PRA-43083 *Hi-graphics ROMs 83A* **$49.95**
PRA-43088 *Tractor option for 82A* **$49.95**
PRA-43080 *Extra ribbons pkg. of 2* **$9.95**

8023 DOT MATRIX - NEC

100 CPS, proportional spacing, hi-resolution graphics, correspondence quality printing, bi-directional tractor & friction feed.

NEC-8023A *8023 parallel* **$499.95**
NEC-8023-01 *8023 ribbon* **$11.95**

TP-1 LETTER QUALITY - SCM

12 CPS daisy wheel printer from Smith Corona.

PRD-45101 *Centronics parallel* **$648.95**
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Uses standard daisy wheels and ribbon cartridges, 16 CPS bi-directional printing, semi-automatic paper loader (single sheet or fan fold), 10/12/15 pitch, up to 16" paper, built-in noise suppression cover.

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Letter quality communications terminal/printer with full typewriter keyboard, 30 CPS Diablo print mechanism, RS-232 interface, includes free printer stand with deluxe casters, print wheel, ribbon, friction feed standard (tractor feed optional), factory refurbished with 30 day warranty, shipped freight collect.

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Circle 48 on Reader Service card.

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MSM-104000 ..... $234.95 ea 2 for **$224.95 ea**

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Shugart SA465 *half-size doule-sided 96 TPI*
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MSM-104500 ..... $349.95 ea 2 for **$329.95 ea**

Tandon TM100-3 *single-sided double-density 96 TPI*
MSM-551003 ..... $294.95 ea 2 for **$269.95 ea**

Tandon TM100-4 *double-sided double-density 96 TPI*
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Shugart SA801R *single-sided double-density*
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Shugart SA851R *double-sided double-density*
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Tandon TM848-2 *double-sided double-den thin-line*
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Qume DT-8 *double-sided double-density*
MSF-750080 ..... $524.95 ea 2 for **$498.95 ea**

Mitsubishi M2894-63 *double-sided double-density*
MSF-289463 ..... $494.95 ea 2 for **$474.95 ea**

Siemens FDD 100-8 *single-sided double-density*
MSF-201120 ..... $274.95 ea 2 for **$249.00 ea**

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Disk Sub-Systems - Jade

Handsome metal cabinet with proportionally balanced air flow system, rugged dual drive power supply, power cable kit, power switch, line cord, fuse holder, cooling fan, never-mar rubber feet, all necessary hardware to mount 2-8" disk drives, power supply, and fan, does not include signal cable.

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END-000434 *A & T w/2 SA-801Rs* **$1195.00**

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END-000437 *A & T w/2 SA-851Rs* **$1474.95**

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Three boards in one, 256K of RAM, RS-232 asynchronous serial interface, and a SASI (Shugart Assoc Standard Interface) hard disk interface.

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Highest quality, extremely versatile proto typing board with gold plated card edge for IBM PC.

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THE BUS PROBE - Jade

Inexpensive S-100 Diagnostic Analyzer

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An on-board pulse generator can provide repetitive resets, interrupts, or wait states, for trouble shooting.

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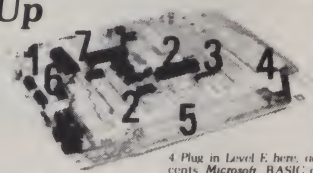

1 Plug in Netronics Hex Keypad/Display
2 Add Level B to convert to S100
3 Add 4k RAM
4 Plug in Level E here, accepts Microsoft BASIC or Editor/Assembler in ROM
5 Add two S100 boards
6 Add you own custom circuits (prototyping area)
7 Connect terminal

Here's the low cost way to learn the fundamentals of computing, the all-important basics you'll need more and more as you advance in computer skills. For just $129.95 you get the advanced-design Explorer/85 motherboard, with all the features you need to learn how to write and use programs. And it can grow into a system that is a match for any personal computer on the market. Look at these features: *8085 Central Processing Unit*, the microprocessor "heart" of the Explorer/85. (Join the millions who will buy and use the 8080/8085 this year alone!) . . . *Four 8-bit plus one 6-bit input/output ports* from which you can input and output your programs, as well as control exterior switches, relays, lights, etc. . . . a cassette interface that lets you store and reload programs you've learned to write . . . *deluxe 2,000 byte operating system/monitor* makes it easy to learn computing in several important ways • It allows simpler, faster writing and entering of programs • It permits access by you to all parts of the system so you can check on the status of any point in the program • It allows tracing each program step by step, with provision for displaying all the contents of the CPU (registers, flags, etc.) • . . . and it does much more!

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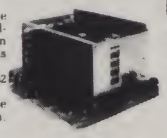

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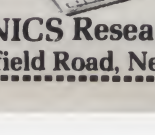

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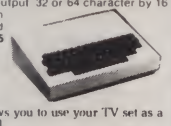

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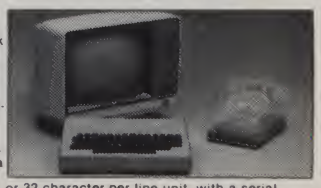

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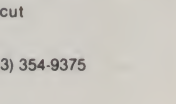

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7417	24	7494	60	74LS20	24	74LS122	.40
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8/1.75ea

EPROMS

1702	4.25	8/3.95ea
2708	3.25	8/2.99ea
2716(5V)	3.95	8/3.65ea
TMS2716	8.95	8/8.00ea
2732(5V)	8.95	8/7.75ea
TMS2532	11.50	8/10.25ea

Circle 297 on Reader Service card.

LINEAR

LM301	.34	LM339	.99	NE564	2.95	LM1496	.85
LM301H	.79	LM340 (see 7800)		LM565	.99	LM1558H	3.10
LM307	.45	LM348	.99	LM566	1.49	LM1800	2.37
LM308	.69	LM350K	4.95	LM567	.89	LM1812	8.25
LM308H	1.15	LM350T	4.60	NE570	3.95	LM1830	3.50
LM309H	1.95	LM358	.69	NE571	2.95	LM1871	5.49
LM309K	1.25	LM359	1.79	NE592	2.75	LM1872	5.49
LM310	1.75	LM376	3.75	LM703	.89	LM1877	3.25
LM311	.64	LM377	1.95	LM709	.59	LM1889	1.95
LM311H	.89	LM378	2.50	LM710	.75	LM1896	1.75
LM312H	1.75	LM379	4.50	LM711	.79	LM2877	2.05
LM317K	3.95	LM380	.89	LM723	.49	LM2878	2.25
LM317T	1.19	LM380N-8	1.10	LM723H	.55	LM2900	.85
LM318	1.49	LM381	1.60	LM733	.98	LM2901	1.00
LM318H	1.59	LM382	1.60	LM741N-8	.35	LM3900	.59
LM319H	1.25	LM383	1.95	LM741N-14	.35	LM3905	1.25
LM319	1.25	LM384	1.95	LM741H	.40	LM3909	.98
LM320 (see 7900)		LM386	.89	LM747	.69	LM3911	2.25
LM322	1.65	LM387	1.40	LM748	.59	LM3914	3.95
LM323K	4.95	LM389	1.35	LM1014	1.19	LM3915	3.95
LM324	.59	LM390	1.95	LM1303	1.95	LM3916	3.95
LM329	.65	LM392	.69	LM1310	1.49	MC4024	3.95
LM331	3.95	LM394H	4.60	MC1330	1.69	MC4044	4.50
LM334	1.19	LM399H	5.00	MC1349	1.89	RC4136	1.25
LM335	1.40	NE531	2.95	MC1350	1.19	RC4151	3.95
LM336	1.75	NE536	6.00	MC1358	1.69	LM4250	1.75
LM337K	3.95	NE555	.34	LM1414	1.59	LM4500	3.25
LM337T	1.95	NE556	.65	LM1458	.59	LM13080	1.29
LM338K	6.95	NE558	1.50	LM1488	.69	LM13600	1.49
		NE561	19.95	LM1489	.69	LM13700	1.49

H = TO-5 CAN T = TO-220 K = TO-3

RCA

CA 3023	2.75	CA 3082	1.65
CA 3039	1.29	CA 3083	1.55
CA 3046	1.25	CA 3086	.80
CA 3059	2.90	CA 3089	2.99
CA 3060	2.90	CA 3096	3.49
CA 3065	1.75	CA 3130	1.30
CA 3080	1.10	CA 3140	1.15
CA 3081	1.65	CA 3146	1.85
		CA 3160	1.19

TI

TL494	4.20	75365	1.95
TL496	1.65	75450	.59
TL497	3.25	75451	.39
75107	1.49	75452	.39
75110	1.95	75453	.39
75150	1.95	75454	.39
75154	1.95	75491	.79
75188	1.25	75492	.79
75189	1.25	75493	.89
		75494	.89

BI FET

TL071	.79	TL084	2.19
TL072	1.19	LF347	2.19
TL074	2.19	LF351	.60
TL081	.79	LF353	1.00
TL082	1.19	LF355	1.10
TL083	1.19	LF356	1.10
		LF357	1.40

VOLTAGE REGULATORS

7805T	.89	7905T	.99
7808T	.89	7908T	.99
7812T	.89	7912T	.99
7815T	.89	7915T	.99
7824T	.89	7924T	.99
7805K	1.39	7905K	1.49
7812K	1.39	7912K	1.49
7815K	1.39	7915K	1.49
7824K	1.39	7924K	1.49
78L05	.69	79L05	.79
78L12	.69	79L12	.79
78L15	.69	79L15	.79
78H05K	9.95	LM323K	4.95
78H12K	9.95	UA78S40	1.95

T = TO-220 K = TO-3
L = TO-92

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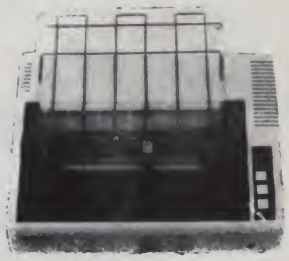

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5101	256 x 4	(450ns) (cmos)	3.95
2102-1	1024 x 1	(450ns)	.89
2102L-4	1024 x 1	(450ns) (LP)	1.29
2102L-2	1024 x 1	(250ns) (LP)	1.69
2111	256 x 4	(450ns)	2.99
2112	256 x 4	(450ns)	2.99
2114	1024 x 4	(450ns)	8/14.95
2114L-4	1024 x 4	(450ns) (LP)	8/15.25
2114L-3	1024 x 4	(300ns) (LP)	8/15.45
2114L-2	1024 x 4	(200ns) (LP)	8/15.95
2147	4096 x 1	(55ns)	4.95
TMS4044-4	4096 x 1	(450ns)	3.49
TMS4044-3	4096 x 1	(300ns)	3.99
TMS4044-2	4096 x 1	(200ns)	4.49
MK4118	1024 x 8	(250ns)	9.95
TMM2016-200	2048 x 8	(200ns)	4.15
TMM2016-150	2048 x 8	(150ns)	4.95
TMM2016-100	2048 x 8	(100ns)	6.15
HM6116-4	2048 x 8	(200ns) (cmos)	4.95
HM6116-3	2048 x 8	(150ns) (cmos)	5.95
HM6116-2	2048 x 8	(120ns) (cmos)	8.95
HM6116LP-4	2048 x 8	(200ns) (cmos)(LP)	6.95
HM6116LP-3	2048 x 8	(150ns) (cmos)(LP)	8.95
HM6116LP-2	2048 x 8	(120ns) (cmos)(LP)	10.95
Z-6132	4096 x 8	(300ns) (Qstat)	34.95

LP = Low Power Qstat = Quasi-Static

DYNAMIC RAMS

TMS4027	4096 x 1	(250ns)	1.99
MK4108	8192 x 1	(200ns)	1.95
MM5298	8192 x 1	(250ns)	1.85
4116-300	16384 x 1	(300ns)	8/11.75
4116-250	16384 x 1	(250ns)	8/11.95
4116-200	16384 x 1	(200ns)	8/13.95
4116-150	16384 x 1	(150ns)	8/15.95
4116-120	16384 x 1	(120ns)	8/29.95
2118	16384 x 1	(150ns) (5v)	4.95
MK4816	2048 x 8	(300ns) (5v)	24.95
4164-200	65536 x 1	(200ns) (5v)	6.25
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5V = single 5 volt supply

EPROMS

1702	256 x 8	(1us)	4.50
2708	1024 x 8	(450ns)	3.95
2758	1024 x 8	(450ns) (5v)	5.95
2716	2048 x 8	(450ns) (5v)	3.95
2716-1	2048 x 8	(350ns) (5v)	6.25
TMS2716	2048 x 8	(450ns)	7.95
TMS2532	4096 x 8	(450ns) (5v)	7.95
2732	4096 x 8	(450ns) (5v)	4.95
2732-250	4096 x 8	(250ns) (5v)	12.95
2732-200	4096 x 8	(200ns) (5v)	16.95
2764	8192 x 8	(450ns) (5v)	16.95
2764-250	8192 x 8	(250ns) (5v)	18.95
2764-200	8192 x 8	(200ns) (5v)	19.95
TMS2564	8192 x 8	(450ns) (5v)	24.95
MC68764	8192 x 8	(450ns) (5v)(24 pin)	call

5v = Single 5 Volt Supply

EPROM ERASERS

	Timer	Capacity Chip	Intensity (uW/Cm²)	
PE-14		6	5,200	83.00
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PE-24T	X	9	6,700	175.00
PL-265T	X	20	6,700	255.00
PR-125T	X	16	15,000	349.00
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1797	54.95
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MC3480	9.00
11C90	13.95
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MC3340	1.49

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68B45	35.95
HD46505SP	15.95
6847	12.25
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4.0 Mhz

Z80A-CPU	6.00
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Z80A-PIO	6.00
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Z80B-CPU	17.95
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Z6132	34.95
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1.0 mhz	4.95
1.8432	4.95
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2.097152	3.95
2.4576	3.95
3.2768	3.95
3.579535	3.95
4.0	3.95
5.0	3.95
5.0688	3.95
5.185	3.95
5.7143	3.95
6.0	3.95
6.144	3.95
6.5536	3.95
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10.7836	3.95
14.31818	3.95
15.0	3.95
16.0	3.95
18.0	3.95
18.432	3.95
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22.1184	3.95
32.0	3.95

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8155	7.95
8156	8.95
8185	29.95
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8741	39.95
8748	29.95
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8202	29.95
8203	39.95
8205	3.50
8212	1.80
8214	3.85
8216	1.75
8224	2.25
8226	1.80
8228	3.49
8237	19.95
8238	4.49
8243	4.45
8250	10.95
8251	4.49
8253	6.95
8253-5	7.95
8255	4.49
8255-5	5.25
8257	7.95
8257-5	8.95
8259	6.90
8259-5	7.50
8271	39.95
8272	39.95
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8279-5	10.00
8282	6.50
8283	6.50
8284	5.50
8286	6.50
8287	6.50
8288	25.00
8289	49.95

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LM566	1.49
XR2206	3.75
8038	3.95

INTERSIL

ICL7103	9.50
ICL7106	9.95
ICL7107	12.95
ICL8038	3.95
ICM7207A	5.59
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6800

68000	99.95
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6809E	19.95
6809	12.95
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6820	4.95
6821	3.25
6828	14.95
6840	12.95
6843	34.95
6844	25.95
6845	14.95
6847	12.25
6850	3.45
6852	5.75
6860	9.95
6862	11.95
6875	6.95
6880	2.25
6883	24.95
68047	24.95
68488	19.95

6800 = 1MHZ

68B00	10.95
68B02	22.25
68B09E	29.95
68B09	29.95
68B10	7.95
68B21	12.95
68B45	35.95
68B50	12.95

68B00 = 2 MHZ

6500

1 MHZ

6502	5.95
6504	6.95
6505	8.95
6507	9.95
6520	4.35
6522	8.75
6532	11.25
6545	22.50
6551	11.85

2 MHZ

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6502B	14.95

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XR 2211	5.25
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74LS00	.24	74LS86	.39	74LS169	1.75	74LS323	2.75
74LS01	.25	74LS90	.55	74LS170	1.49	74LS324	1.75
74LS02	.25	74LS91	.89	74LS173	.69	74LS352	1.29
74LS03	.25	74LS92	.55	74LS174	.55	74LS353	1.29
74LS04	.24	74LS93	.55	74LS175	.55	74LS363	1.35
74LS05	.25	74LS95	.75	74LS181	2.15	74LS364	1.95
74LS08	.28	74LS96	.89	74LS189	8.95	74LS365	.49
74LS09	.29	74LS107	.39	74LS190	.89	74LS366	.49
74LS10	.25	74LS109	.39	74LS191	.89	74LS367	.45
74LS11	.35	74LS112	.39	74LS192	.79	74LS368	.45
74LS12	.35	74LS113	.39	74LS193	.79	74LS373	.99
74LS13	.45	74LS114	.39	74LS194	.69	74LS374	.99
74LS14	.59	74LS122	.45	74LS195	.69	74LS377	1.39
74LS15	.35	74LS123	.79	74LS196	.79	74LS378	1.18
74LS20	.25	74LS124	2.90	74LS197	.79	74LS379	1.35
74LS21	.29	74LS125	.49	74LS221	.89	74LS385	1.90
74LS22	.25	74LS126	.49	74LS240	.95	74LS386	.45
74LS26	.29	74LS132	.59	74LS241	.99	74LS390	1.19
74LS27	.29	74LS133	.59	74LS242	.99	74LS393	1.19
74LS28	.35	74LS136	.39	74LS243	.99	74LS395	1.19
74LS30	.25	74LS137	.99	74LS244	.99	74LS399	1.49
74LS32	.29	74LS138	.55	74LS245	1.49	74LS424	2.95
74LS33	.55	74LS139	.55	74LS247	.75	74LS447	.37
74LS37	.35	74LS145	1.20	74LS248	.99	74LS490	1.95
74LS38	.35	74LS147	2.49	74LS249	.99	74LS624	3.99
74LS40	.25	74LS148	1.35	74LS251	.59	74LS668	1.69
74LS42	.49	74LS151	.55	74LS253	.59	74LS669	1.89
74LS47	.75	74LS153	.55	74LS257	.59	74LS670	1.49
74LS48	.75	74LS154	1.90	74LS258	.59	74LS674	9.65
74LS49	.75	74LS155	.69	74LS259	2.75	74LS682	3.20
74LS51	.25	74LS156	.69	74LS260	.59	74LS683	3.20
74LS54	.29	74LS157	.65	74LS266	.55	74LS684	3.20
74LS55	.29	74LS158	.59	74LS273	1.49	74LS685	3.20
74LS63	1.25	74LS160	.69	74LS275	3.35	74LS688	2.40
74LS73	.39	74LS161	.65	74LS279	.49	74LS689	3.20
74LS74	.35	74LS162	.69	74LS280	1.98	74LS783	24.95
74LS75	.39	74LS163	.65	74LS283	.69	81LS95	1.49
74LS76	.39	74LS164	.69	74LS290	.89	81LS96	1.49
74LS78	.49	74LS165	.95	74LS293	.89	81LS97	1.49
74LS83	.60	74LS166	1.95	74LS295	.99	81LS98	1.49
74LS85	.69	74LS168	1.75	74LS298	.89	25LS2521	2.80
						25LS2569	4.25

IC SOCKETS

	1-99	100
8 pin ST	.13	.11
14 pin ST	.15	.12
16 pin ST	.17	.13
18 pin ST	.20	.18
20 pin ST	.29	.27
22 pin ST	.30	.27
24 pin ST	.30	.27
28 pin ST	.40	.32
40 pin ST	.49	.39
ST = SOLDERTAIL		
8 pin WW	.59	.49
14 pin WW	.69	.52
16 pin WW	.69	.58
18 pin WW	.99	.90
20 pin WW	1.09	.98
22 pin WW	1.39	1.28
24 pin WW	1.49	1.35
28 pin WW	1.69	1.49
40 pin WW	1.99	1.80
WW = WIREWRAP		
16 pin ZIF	6.75	call
24 pin ZIF	9.95	call
ZIF = TEXTOOL (Zero Insertion Force)		

CONNECTORS

RS232 MALE	2.95
RS232 FEMALE	3.50
RS232 FEMALE RIGHT ANGLE	5.25
RS232 HOOD	1.25
S-100 ST	3.95
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4 POSITION	.85
5 POSITION	.90
6 POSITION	.90
7 POSITION	.95
8 POSITION	.95

7400

7400	.19	74132	.45
7401	.19	74136	.50
7402	.19	74141	.65
7403	.19	74142	2.95
7404	.19	74143	2.95
7405	.25	74145	.60
7406	.29	74147	1.75
7407	.29	74148	1.20
7408	.24	74150	1.35
7409	.19	74151	.55
7410	.19	74152	.65
7411	.25	74153	.55
7412	.30	74154	1.25
7413	.35	74155	.75
7414	.49	74156	.65
7416	.25	74157	.55
7417	.25	74159	1.65
7420	.19	74160	.85
7421	.35	74161	.69
7422	.35	74162	.85
7423	.29	74163	.69
7425	.29	74164	.85
7426	.29	74165	.85
7427	.29	74166	1.00
7428	.45	74167	2.95
7430	.19	74170	1.65
7432	.29	74172	5.95
7433	.45	74173	.75
7437	.29	74174	.89
7438	.29	74175	.89
7440	.19	74176	.89
7442	.49	74177	.75
7443	.65	74178	1.15
7444	.69	74179	1.75
7445	.69	74180	.75
7446	.69	74181	2.25
7447	.69	74182	.75
7448	.69	74184	2.00
7450	.19	74185	2.00
7451	.23	74186	18.50
7453	.23	74190	1.15
7454	.23	74191	1.15
7460	.23	74192	.79
7470	.35	74193	.79
7472	.29	74194	.85
7473	.34	74195	.85
7474	.33	74196	.79
7475	.45	74197	.75
7476	.35	74198	1.35
7480	.59	74199	1.35
7481	1.10	74221	1.35
7482	.95	74246	1.35
7483	.50	74247	1.25
7485	.59	74248	1.85
7486	.35	74249	1.95
7489	2.15	74251	.75
7490	.35	74259	2.25
7491	.40	74265	1.35
7492	.50	74273	1.95
7493	.35	74276	1.25
7494	.65	74279	.75
7495	.55	74283	2.00
7496	.70	74284	3.75
7497	2.75	74285	3.75
74100	1.75	74290	.95
74107	.30	74293	.75
74109	.45	74298	.85
74110	.45	74351	2.25
74111	.55	74365	.65
74116	1.55	74366	.65
74120	1.20	74367	.65
74121	.29	74368	.65
74122	.45	74376	2.20
74123	.49	74390	1.75
74125	.45	74393	1.35
74126	.45	74425	3.15
74128	.55	74426	.85
		74490	2.55

CMOS

4000	.29	4528	1.19
4001	.25	4531	.95
4002	.25	4532	1.95
4006	.89	4538	1.95
4007	.29	4539	1.95
4008	.95	4543	1.19
4009	.39	4555	.95
4010	.45	4556	.95
4011	.25	4581	1.95
4012	.25	4582	1.95
4013	.38	4584	.75
4014	.79	4585	.75
4015	.39	4702	12.95
4016	.39	74C00	.35
4017	.69	74C02	.35
4018	.79	74C04	.35
4019	.39	74C08	.35
4020	.75	74C10	.35
4021	.79	74C14	.59
4022	.79	74C20	.35
4023	.29	74C30	.35
4024	.65	74C32	.39
4025	.29	74C42	1.29
4026	1.65	74C48	1.99
4027	.45	74C73	.65
4028	.69	74C74	.65
4029	.79	74C76	.80
4030	.39	74C83	1.95
4034	1.95	74C85	1.95
4035	.85	74C86	.39
4040	.75	74C89	4.50
4041	.75	74C90	1.19
4042	.69	74C93	1.75
4043	.85	74C95	.99
4044	.79	74C107	.89
4046	.85	74C150	5.75
4047	.95	74C151	2.25
4049	.35	74C154	3.25
4050	.35	74C157	1.75
4051	.79	74C160	1.19
4053	.79	74C161	1.19
4060	.89	74C162	1.19
4066	.39	74C163	1.19
4068	.39	74C164	1.39
4069	.29	74C165	2.00
4070	.35	74C173	.79
4071	.29	74C174	1.19
4072	.29	74C175	1.19
4073	.29	74C192	1.49
4075	.29	74C193	1.49
4076	.79	74C195	1.39
4078	.29	74C200	5.75
4081	.29	74C221	1.75
4082	.29	74C373	2.45
4085	.95	74C374	2.45
4086	.95	74C901	.39
4093	.49	74C902	.85
4098	2.49	74C903	.85
4099	1.95	74C905	10.95
14409	12.95	74C906	.95
14410	12.95	74C907	1.00
14411	11.95	74C908	2.00
14412	12.95	74C909	2.75
14419	7.95	74C910	9.95
4502	.95	74C911	8.95
4503	.65	74C912	8.95
4508	1.95	74C914	1.95
4510	.85	74C915	1.19
4511	.85	74C918	2.75
4512	.85	74C920	17.95
4514	1.25	74C921	15.95
4515	1.79	74C922	4.49
4516	1.55	74C923	4.95
4518	.89	74C925	5.95
4519	.39	74C926	7.95
4520	.79	74C927	7.95
4522	1.25	74C928	7.95
4526	1.25	74C929	19.95
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74S05	.35	74S175	.95
74S08	.35	74S181	3.95
74S09	.40	74S182	2.95
74S10	.35	74S188	1.95
74S11	.35	74S189	6.95
74S15	.35	74S194	1.49
74S20	.35	74S195	1.49
74S22	.35	74S196	1.49
74S30	.35	74S197	1.49
74S32	.40	74S201	6.95
74S37	.88	74S225	7.95
74S38	.85	74S240	2.20
74S40	.35	74S241	2.20
74S51	.35	74S244	2.20
74S64	.40	74S251	.95
74S65	.40	74S253	.95
74S74	.50	74S257	.95
74S85	1.99	74S258	.95
74S86	.50	74S260	.79
74S112	.50	74S274	19.95
74S113	.50	74S275	19.95
74S114	.55	74S280	1.95
74S124	2.75	74S287	1.90
74S132	1.24	74S288	1.90
74S133	.45	74S289	6.89
74S134	.50	74S301	6.95
74S135	.89	74S373	2.45
74S138	.85	74S374	2.45
74S139	.85	74S381	7.95
74S140	.55	74S387	1.95
74S151	.95	74S412	2.98
74S153	.95	74S471	4.95
74S157	.95	74S472	4.95
74S158	.95	74S474	4.95
74S161	1.95	74S482	15.25
74S162	1.95	74S570	2.95
		74S571	2.95

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Z-90 64K	CALL
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READER SERVICE

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My vote for the best advertisement in this issue goes to _____ (company) whose Reader Service number is _____

A. What microcomputer system(s) do you own? Check all that apply

- 1. Apple II
- 2. Apple III
- 3. Atari 400
- 4. Atari 800
- 5. DEC
- 6. Heath H8
- 7. Heath H89
- 8. Heath Z90
- 9. Hewlett-Packard
- 10. IBM PC
- 11. Osborne I
- 12. OSI
- 13. PET
- 14. PMC-80/81
- 15. S-100 based system Which one? _____
- 16. Sinclair ZX-80
- 17. Sinclair ZX-81/Timex 1000
- 18. TI 99/4 A
- 19. TRS-80 Mod I
- 20. TRS-80 Mod II
- 21. TRS-80 Mod III
- 22. TRS-80 Color
- 23. TRS-80 Pocket
- 24. VIC-20
- 25. Other (specify) _____
- 26. Don't yet own one

B. Would you purchase your next computer from the same manufacturer?

- 1. Yes
- 2. No

C. Are you currently using CP/M on your system?

- 1. Yes
- 2. No

D. What types of software have you purchased during the last year?

- 1. Word Processing
- 2. Database Management
- 3. Game
- 4. Utility
- 5. Business
- 6. Home Finance/Household
- 7. Education
- 8. Scientific
- 9. Other (please specify) _____

E. What types of software do you plan to purchase during the next year?

- 1. Word Processing
- 2. Database Management
- 3. Game
- 4. Utility
- 5. Business
- 6. Home Finance/Household
- 7. Education
- 8. Scientific
- 9. Other (please specify) _____

F. Where do your children use computers?

- 1. Home
- 2. School
- 3. Both
- 4. Don't use computers

G. What peripheral equipment have you purchased during the last year?

- 1. Printer
- 2. Plotter
- 3. Floppy disk drives
- 4. Hard disk drives
- 5. Expansion interface
- 6. Modem
- 7. Monitor
- 8. Other (please specify) _____

H. What peripheral equipment do you plan to purchase during the next year?

- 1. Printer
- 2. Plotter
- 3. Floppy disk drives
- 4. Hard disk drives
- 5. Expansion interface
- 6. Modem
- 7. Monitor
- 8. Other (please specify) _____

I. What low-end computer system(s) are you considering buying?

- 1. Commodore VIC
- 2. Commodore Max
- 3. Sinclair Spectrum
- 4. Sinclair Spectrum
- 5. ZX-81/Timex 1000
- 6. Atari 400
- 7. TRS-80 Color Computer

J. What is your annual household income?

- 1. Under $20,000
- 2. $20,000-$40,000
- 3. $40,000-$60,000
- 4. $60,00-$80,000
- 5. $80,000-$100,000
- 6. Over $100,000

K. I have stopped subscribing to the following publications:

- 1. Byte
- 2. Compute
- 3. Creative Computing
- 4. InfoWorld
- 5. Interface Age
- 6. Personal Computing
- 7. Popular Computing
- 8. Softalk
- 9. Other _____

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27	32	37	42	47	152	157	162	167	172	277	282	287	292	297	402	407	412	417	422
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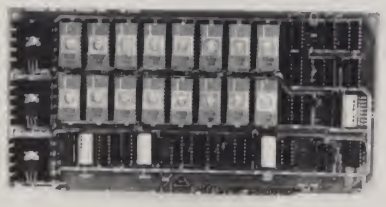

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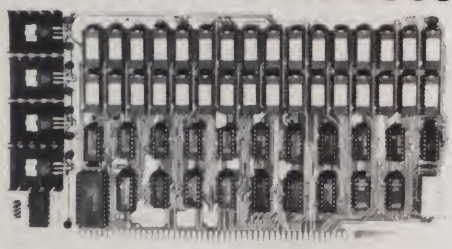

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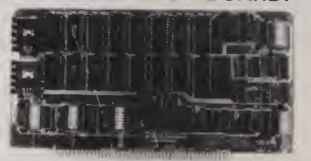

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  - **D. As a 32K Static RAM Board**
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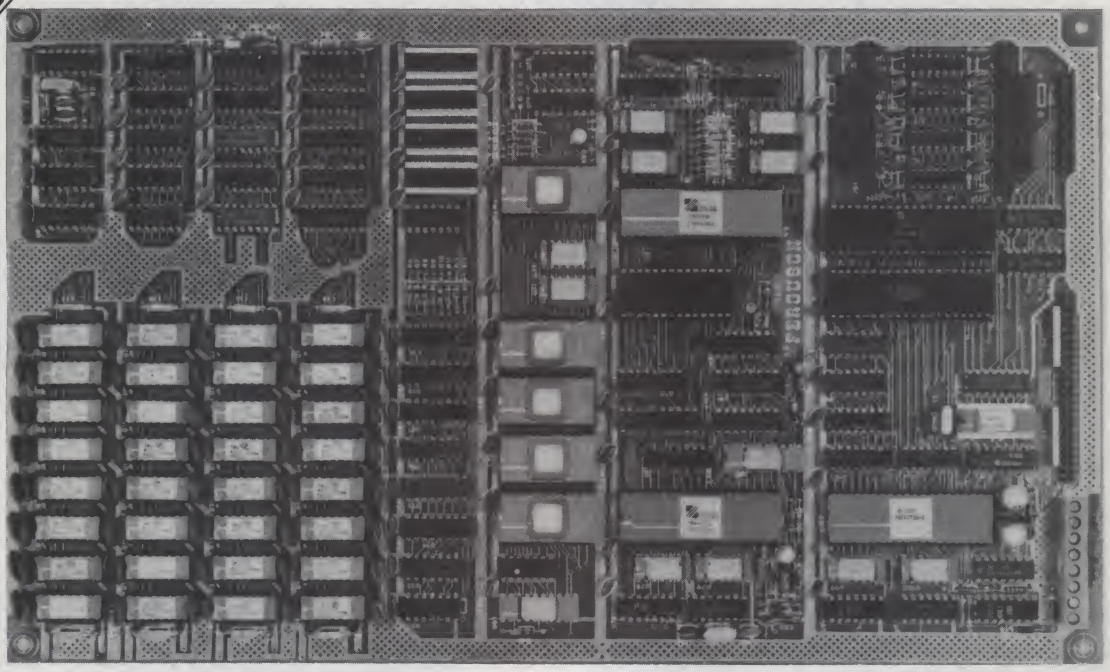

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74LS

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LS02	.24	LS42	.49	LS138	.50	LS169	1.25	LS243	.90	LS367	.40
LS04	.24	LS74	.30	LS139	.50	LS174	.50	LS244	.90	LS368	.40
LS05	.24	LS85	.60	LS151	.50	LS175	.50	LS245	1.50	LS373	.99
LS08	.24	LS86	.39	LS153	.50	LS181	1.99	LS257	.45	LS374	.75
LS10	.24	LS90	.50	LS154	1.75	LS191	.90	LS258	.45	LS375	1.19
LS12	.30	LS93	.55	LS155	.50	LS192	.80	LS266	.50	LS377	1.49
LS14	.50	LS109	.39	LS157	.60	LS193	.80	LS273	1.25	LS390	1.19
LS20	.24	LS112	.39	LS161	.60	LS195	.65	LS279	.45	LS393	1.19
LS21	.25	LS123	.75	LS162	.65	LS221	.80	LS283	.60	LS399	.99
LS27	.24	LS124	2.75	LS163	.50	LS240	.75	LS290	.85		
LS30	.24	LS125	.45	LS164	.60	LS241	.80	LS293	.85		

VOLTAGE REGULATOR

723C 3/1.10
78M05 - +5v - 500 MA TO 220 ..... 3/1.10

7805	.99	7905	.99
7808	.99	7912	.99
7812	.99	7915	.99
7815	.99	7924	.99
7824	.99		

LM317T - TO 220 ..... 1.10
LM323K-+5v-3A. TO-3 ..... 3.50 3/9.00
LAS 1412-+12v-3A TO-3 ..... 3.50 3/9.00
7812CK-TO-3 +12V, 1A 1.00
7905-TO-3 -5v 1A 1.00

MISCELLANEOUS

AY3-8910-Sound Chip with 60 page data manual 9.95
MC 1408L6 D to A Converter 8 Bit 1.79
DM8131 6 Bit Unified Bus Comparator 2.99

UART
TR1602-UART same as AY5-1013 ..... 1.99
IM6402-+5v High speed UART-AY5-1013 pin out 1.65
INS 8250B 9.95

FDC
1771 Single Density FDC 17.50
1791 Double Density FDC ... 23.50
1797 - FDC 20.95

CRT CONT.
5027-CRT Controller - Programmable - 24 x 80 .... 14.95
68B45 - Motorola (HD46505SP) CRT Controller 17.50

BIT SLICE

AMD2901-4 Bit Slice 7.95
AMD2903-4 Bit Super Slice 12.95
AMD2911 Sequencer 3.95
AMD29705-16 Register Files 4.95

BAUD RATE GENERATOR

COM8116 ..... 9.50
INS8250B 9.95

Z80

Z80 2.5 MHZ CPU 3.50
Z80DMA-DMA Controller 9.95
Z80PIO - Parallel 3.95
Z80SIO/O Chan. Ser. 16.95
Z80A-4MHZ CPU 4.95
Z80A-PIO 5.95
Z80A SIO/O 19.95
Z80B 6 MHZ CPU 14.95

EPROM SPECIAL

We bought a large quantity of 2708s from a computer manufacturer who redesigned their boards. We removed them from sockets, erased and verified them, and now we offer the savings to you. Complete satisfaction guaranteed.

$1.49 or 10/$12.00

EPROM

1702A 256X8 1 us 2.00
2708 1KX8 450 n.s. 2.20
27A08 1KX8 350 n.s. 3.95
2758 1KX8 +5V 450 n.s 3.95
2716 2KX8+5v 450 n.s. 3.20
2716-1 2KX8+5v 350 n.s. 7.95
2732 4KX8 450 n.s. Intel P. O. ... 6.95
2732A-2 200 n.s. 10.95
2732A-3 4K x 8 350 n.s. L.P. 8.95
2532 4KX8 450 n.s. T.I. P. O. 7.50

SOCKETS

Low Profile SOLDER TAIL

8 Pin	13/1.00
14 Pin	10/1.00
16 Pin	8/1.00
18 Pin	8/1.00
20 Pin	7/1.00
24 Pin	6/1.00
28 Pin	6/1.00
40 Pin	5/1.00

BUY $10 GET $1.00 - FREE CHOICE

TERMS: Add $1.50 postage, we pay balance. Orders over $50.00 add 85¢ for insurance. No C.O.D. Texas Res. add 5% Tax. 90 Day Money Back Guarantee on all items. All items subject to prior sale. Prices subject to change without notice. Foreign order - U.S. funds only. We cannot ship to Mexico. Countries other than Canada, add $3.50 shipping and handling.

CONSUMER PRODUCTS

SECURITY ALARM SYSTEMS

Home Alarm System

• Self-Installation • Presettable w/individual 3-digit code — no key nec. • Instant or 10-sec. delayed warning system • Alarm system incl. window & door contacts • One 9V battery required (not incl.) Low power consumption (0.01mA) • Loud audible alarm (90db) • Delayed exit feature • System complete w/one control station with built-in siren and test button; 4 magnetic contact sets & connecting wires for entire system

ST-05 Home Alarm System **$59.95**

Door Security System

• Coded door alarm. • Instant or 7-second delay system. • Alarm activated as door is opened. • Can be de-activated by pressing personal code. • Power: One 9V battery (not incl.). • System includes one personal coded keyboard and one magnetic sensor.

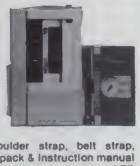
ES-07 Door Alarm **$29.95**

Anti-Theft Auto Alarm System

• Audible horn is activated when door or trunk is opened • Alarm sounds for 3 min. — unless turned off by secret 3-digit code. • Wire cutting will not deactivate alarm • Code set by owner. • Uses only D.01mA power. • System complete w/one black-box control unit, one personal coded keyboard, 2 sets of sensors, one audible horn, & wiring (incl. one 10A fuse).

CA-06 Auto Alarm **$59.95**

Stereo Cassette Player
with FM Stereo Tuner Pack



- Lightweight Headphones
- Cr02/Metal/Normal Tape Selector
- Anti-Rolling Mechanism

FEATURES: • Blue carrying case, shoulder strap, belt strap, lightweight headphones, FM stereo tuner pack & instruction manual • Talkline • Tone selector • Cr02/Metal/Normal tape selector • LED operation indicator • Built-in microphone • Stop/eject, play, rewind/review, fast forward/cue, tape/radio selector functions • Vol. control • Ext. power input jack • Headphone jack • Auto-stop mechanism (shuts off player when tape ends) • Anti-rolling mechanism (prevents sound from quivering when walking, jogging, etc.) • Weight: 13 oz. • Requires 4 AA batteries (not included) • Size: 6"L x 4"W x 1-1/8"H

Model TWF-802 ..... **$69.95**
AM3-4 AA Alkaline Batteries ..... **4/$3.95**

UTIC Mini Stereo AM/FM Receiver

WITH HEADPHONES
For Joggers, Cyclists, Skaters & Sports Events

FEATURES: Lightweight headphones. Left/right balance control. Full fidelity stereo sound. Additional black soft carrying case and shoulder strap. Belt clip (hands free). Operates on 3 AA cell batteries (not incl. - see below). Compact size: 3-1/6"H x 4-7/8"L x 1"D. Wt. 6 oz.

Model 2830 ..... **$29.95**
AM3-3 AA Alkaline Batteries ..... **3/$2.95**

TV GAME SWITCH

Switches TV to video game or computer operation. Used on Atari.

TGS-1 . . . $2.95 ea.

ATARI

JOYSTICKS
JSA (2) . . . $6.95/pair

PADDLES
JSP (2) . . . $4.95/pair

Mostek DC/DC Converter +5 VOLTS TO -9 VOLTS

Input: +5V. Output: -9V (regulated) @ 30mA. Printed circuit mounting. Specifications incl.

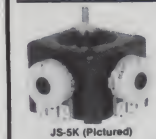
DC10 ..... **$2.95 ea. or 2/$4.95**

Universal Computer Keyboard Enclosure

"DTE" Blank Desk-Top Enclosures are designed for easy modification. High strength epoxy molded end pieces in mocha brown finish. Sliding rear/bottom panel for service/component access. Top/bott. panels .080" thick alum. alodine type 1200 finish (gold tint color) for best paint adhesion after modification. Vented top & bottom panels for cooling efficiency.

DTE-20 Panel width 20" **$34.95**

JOYSTICKS



JS-5K (Pictured)

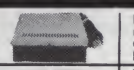
JS-5K	5K Linear Taper Pots	$5.25
JS-100K	100K Linear Taper Pots	$4.95
JS-150K	150K Linear Taper Pots	$4.75
JVC-40	40K (2) Video Controller In Case	$4.95
JS KNOB	Knob for JS5K,100K,150K	$.99 ea.
JVC KNOB	Knob for JVC-40	$.99 ea.

Wall Transformers AC and DC Types

AC250 (Picturad)

Part No.	Input	Output	Price
AC 250 (above)	117V/60Hz	12VAC 250mA	$3.95
AC 500	117V/60Hz	12VAC 500mA	$4.95
AC1000	117V/60Hz	12VAC 1 amp	$5.95
AC9004	117V/60Hz	9.2VAC 2.5 amp	$3.95
DC 800	120V/60Hz	8VDC 400mA	$1.95
DC8912	120V/60Hz	8,9,12VDC 300mA	$8.95
DC5490	117V/60Hz	9.5VDC 275mA	$2.95
DC900	120V/60Hz	9VDC 500mA	$3.95
DC1200	120V/60Hz	12VDC 300mA	$2.95
DV9200	117V/60Hz	9VAC 200mA	$3.25

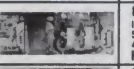
POWER SUPPLIES — KEYBOARDS



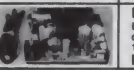
POWER SUPPLY +5VDC @ 1 AMP REGULATED *Transaction Tech*
Output +5VDC @ 1A (also +30VDC) reg. Input 115VAC 60Hz. 2-tone (black/beige) self-enclosed case. 6 ft., 3 cond. black power cord. 6½"W x 7"D x 2¼"H. Wt. 3 lbs. Data sheet incl.
Part No. PS51194 ..... **$19.95 each**

POWER SUPPLY +5VDC @ 1 AMP REGULATED *B Industries*
Output +5VDC @ 1 amp, +36-42VDC adj. 400mA or less, 30VAC (isol.) @ 1.5 amp. Input 115VAC 60Hz. Circ. brkr. re-set button. Blk. self-encl. case w/4 rubber feet. 6 ft., 3 cond. blk. pow. cord. On/off switch. 5¾"W x 7¾"D x 3-7/8"H • wt. 7 lbs. Data sheet included.
Part No. PS4D7D ..... **$24.95 each**

POWER SUPPLY +5VDC @ 3 AMP REGULATED *Deltron*
Input: 115VAC, 47-440Hz. Output: 5VDC Adjustable @ 3 amp, 6VDC @ 2.5 amp. Adjustable current limit. Ripple & Noise: 1MV rms, 5MV p-p — 2 mounting surfaces. UL recognized. Size: 4"W x 4½"L x 2-7/16"H • wt. 2 lbs. Data sheet included.
Part No. 0PS-1 ..... **$29.95 each**



MULTI-VOLTAGE POWER SUPPLY +5, +12, —12VDC REGULATED
Input: 105-125VAC, 47-63Hz / 205-250VAC, 47-63Hz. Output: +5VDC @ 2 amps Adj., 5VDC @ 50mA Fixed, +12VDC @ 1 amp Adj., —12V @ 2 amp adj. Overvoltage protection. Size: 12½"L x 4-7/8"W x 3¾"D. Data sheet included.
Part No. RA0250 ..... **$39.95 each**

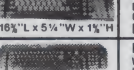


POWER SUPPLY +5VDC @ 7.5 AMP, 12VDC @ 1.5 AMP SWITCHING
Input: 115VAC, 50-60Hz @ 3 amp/230VAC, 50Hz @ 1.5 amp. Fan volt./power supply select switches (115/230VAC). Output: 5VDC @ 7.5 amp, 12VDC @ 1.6 amp, 8 ft. blk. pow. cord. 11½"W x 13¼"D x 3¾"H. Wt. 6 lbs.
Part No. PS94V0 ..... **$49.95 each**

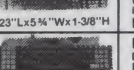
POWER SUPPLY 4-Channel Switching Power Supply
Microprocessor, mini-computer, terminal, medical equipment and process control applications. Input: 90-130VAC 47-440Hz. Output: +5VDC @ 5A, -5VDC @ 1A; +12VDC @ 1A, -12VDC @ 1A. Line reg.: ±0.2%. Ripple: 30mV p-p. Load reg.: ±1%. Overcurrent protection. Adj: 5V main output ± 10%. 6-3/8"L x 1-7/8"W x 4-15/16"H. Wt. 1½ lbs.
Part No. FCS-6D4A ..... **$69.95 each**

POWER SUPPLY Adjustable Switching 4-24VDC to 5 Amps
Adj. 4-24VDC; 5VDC @ 5A, 6VDC @ 4.8A, 9VDC @ 4.1A, 12VDC @ 3.3A, 18VDC @ 1.9A, 24VDC @ .5A. Overvoltage Protection. Input: 115VAC 50/60Hz. Output variations within 20mV. 8.25"L x 4.25"W x 2.25"H. Wt. 3.25 lbs.
JE224 KR ..... **$79.95 each**
JE224A Assembled & Tested ..... **$99.95 each**

MICRO SWITCH 69-KEY KEYBOARD
Data Entry Keyboard, Encoded Output: 8-bit Parallel EBC DIC. Switching: Hall Effect, 24-pin Edge Card Connection. Complete w/Pin Connection. Can easily be modified to ASCII code.
16¾"L x 5¼"W x 1⅝"H — **Part No. KB69SD12-2** (Fits into DTE-2D Enclosure) ..... **$19.95 each**



MICRO SWITCH 85-KEY KEYBOARD
Word Processing Keyboard, 26 Pin Edge Card Connection. Supply Voltage +5VDC. Main Keyboard is QWERTY. Additional Key Pads for Cursor end word processing functions.
23"Lx5¾"Wx1-3/8"H — **Part No. 85SD18-1** ..... **$29.95 each**

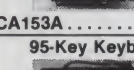


MICRO SWITCH 88-KEY KEYBOARD (PARALLEL)
Data Entry Keyboard used in a Diablo 1640 Terminal. Supply Voltage: +5V, -12V. Switching: Hall Effect — 10-pin Edge Card Connection. Schematic included. Uses 6048 Encoder Chip.
18¼"L x 5¾"W x 1⅝"H — **Part No. 88SD22** (Fits into DTE-2D Enclosure) ..... **$69.95 each**

84-Key Keyboard

CA153A **$69.95**

95-Key Keyboard



CA154A **$79.95**

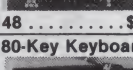
CONTROL DATA Data Entry Keyboards

RS232 Interface
FT2 Shielded Base
SPST Switching Momentary Contact Keyswitches
30" Interface Cable
Attractive Case

104-Key Keyboard

CA148 ..... **$99.95**

80-Key Keyboard



CA150C **$89.95**

Color; keycaps: black, blue, red - cover: black w/beige base. 21½"x9"x3½". 6 lbs.

BUG BOX™

• Stores 60 8-pin or 30 14- or 16-pin DIPs • Heavy duty injection molded plastic • Clear plastic cover slides & locks • Cover marked w/numbers 1-30 • Compartment size: 1" x 3.75" x .5" deep • Box size: 4.9" x 3.3" x .6" • Weight: 1.75 oz.

BUG BOX™

Please specify color code: (B) Blue, (R) Red, (W) White, (Y) Yellow

Part No./Color Code		QTY	PRICE
BGX-001-( )		1	$ 2.29
BGX-010-( )		10	19.99
	ANTI-STATIC		
BGX-001-( )AS		1	$ 3.29
BGX-010-( )AS		10	28.89

BUG CAGE™ — 12 locations store Bug Boxes.

Big Bug Boxes or Bug Trays • Modular and interlocking • Heavy duty injection molded plastic • Each cage has 6 slip-on locations • 2 cages per pkg. • Cage size: 5-1/8" x 5" x 3-7/8" • 4 colors available — please specify color code: (B) Blue, (R) Red, (W) White, (Y) Yellow

Part No./Color Code	Price
BGC-001-( ) 2 Cages (6 loc. ea.)	$11.95/pkg.

BUG TRAY™ — Stores in Bug Cage • Molded

plastic • Three styles: Open (1 compartment 3.05" x 4.6" x .6"); Vertical (5 compartments .5" x 4.6" x .6"); and Horizontal (8 compartments .4" x 3.95" x .6") • Ideal for tools, hardware, components, etc. • Tray size: 3.55" x 5.05" x .6" • Black color only

PART NO.	DESCRIPTION	PRICE
BTH-001	Horizontal Bug Tray	$1.95
BTV-001	Vertical Bug Tray	1.95
BTO-001	Open Bug Tray	1.95
BTX-003	1 of each Bug Tray (3)	4.98

BUG BOX™ STORAGE SYSTEMS

BUG CAGE™ (BGC-001-____) with Bug Boxes

LSI BIG BUG BOX™ — Designed to store

large IC's, Resistors, Capacitors and Diodes • Divided into three compartments measuring 1" x 4.15" x .5" deep • Three vertical and three horizontal dividers included • Heavy duty injection molded plastic • Box size: 4.9" x 3.3" x .6" • Weight: 1.75 oz.

LSI BIG BUG BOX™

Please specify color code: (B) Blue, (R) Red, (W) White, (Y) Yellow

PART NO./COLOR CODE		QTY	PRICE
BLX-001-( )		1	$ 3.29
BLX-010-( )		10	28.79
	ANTI-STATIC		
BLX-001-( )AS		1	$ 4.29
BLX-010-( )AS		10	37.89

BACK PACK™ — Self-adhesive labels for the

back of ICs • Shows exact internal logic in relation to IC pins • 532 labels in each package (including several blank labels) • Each package for 8, 14, 16, 24, 28 and 40-pin ICs • Combo package includes 1,068 labels for TTL and CMOS ICs • Microprocessor package contains 744 labels

Part No.	Description	Price
BPT-012	TTL	$7.95
BPC-012	CMOS	8.95
BPM-012	Combo	14.95
BPU-012	Microprocessor	9.95

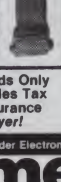
JUMPER AND CABLE ASSEMBLIES

Custom Jumpers! *Custom Cables!*

STANDARD DIP JUMPERS

All jumpers use low profile dip plugs with heavy duty pins for repeated disconnect applications.

JAMECO Part No.	AP Cross Reference	No. Pins	Description	Wire Length	Price
DJ14-1	924102-12	14	single end	12"	$1.79
DJ14-2	924102-24	14	single end	24"	2.05
DJ14-3	924102-36	14	single end	36"	2.35
DJ14-1-14	924106-12	14	double end	12"	2.95
DJ14-2-14	924106-24	14	double end	24"	3.19
DJ14-3-14	924106-36	14	double end	36"	3.49
DJ16-1	924112-12	16	single end	12"	1.89
DJ16-2	924112-24	16	single end	24"	2.19
DJ16-3	924112-36	16	single end	36"	2.59
DJ16-1-16	924116-12	16	double end	12"	2.95
DJ16-2-16	924116-24	16	double end	24"	3.29
DJ16-3-16	924116-36	16	double end	36"	3.59
DJ24-1	924122-12	24	single end	12"	2.89
DJ24-2	924122-24	24	single end	24"	3.19
DJ24-3	924122-36	24	single end	36"	3.59
DJ24-1-24	924126-12	24	double end	12"	4.49
DJ24-2-24	924126-24	24	double end	24"	4.95
DJ24-3-24	924126-36	24	double end	36"	5.39



STANDARD DB25 SERIES CABLES

Now you can order DB25 P or S connectors with the cable necessary to fit your application. Choose from our standard flat cable in 4 foot lengths. **Call today.**

STANDARD CABLES

Part No.	Cable Length	Connectors	Price
DB25P-4	4 feet	1-DB25P	$7.95
DB25S-4	4 feet	1-DB25S	8.49
DB25P-4-P	4 feet	2-DB25P	13.49
DB25P-4-S	4 feet	1-DB25P/1-DB25S	13.75
DB25S-4-S	4 feet	2-DB25S	13.95

$10.00 Minimum Order — U.S. Funds Only
California Residents Add 6½% Sales Tax
Postage — Add 5% plus $1.50 Insurance
Send S.A.S.E. for Monthly Sales Flyer!

Spec Sheets — 30¢ each
Send $1.00 Postage for your *FREE 1983 JAMECO CATALOG*
Prices Subject to Change

Call for Quantity Discounts

Mail Order Electronics · Worldwide

Jameco ELECTRONICS

1983 Jameco Calendar Poster 16½" x 21½" $3.95

1355 SHOREWAY ROAD, BELMONT, CA 94002

1/83 *PHONE ORDERS WELCOME — (415) 592-8097 Telex: 176043*

EXPAND YOUR MEMORY

TRS-80 to 16K, 32K, or 48K

**Model 1 =	From 4K to 16K Requires (1) One Kit
Model 3 =	From 4K to 48K Requires (3) Three Kits
Color =	From 4K to 16K Requires (1) One Kit

**Model 1 equipped with Expansion Board up to 48K Two Kits Required — One Kit Required for each 16K of Expansion —

TRS-16K3 *200ns for Color & Model III $12.95
TRS-16K4 *250ns for Model I $10.95

TRS-80 Color 32K or 64K Conversion Kit

Kit comes complete with 8 ea. 4164-2 (200ns). 64K Dyn. RAMs & conversion documentation. Converts TRS-80 color computers from 4K-32K Memory or 16K-64K Memory.

TRS-64K2 (200ns) **$54.95**

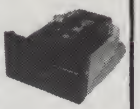
5¼" Mini-Floppy Disc Drive

FOR TRS-80 MODEL I (Industry Standard)

Pertec Computer Corp.

Features single or double density. Recording mode: FM single, MFM double density. Power: +12VDC (±0.6V) 1.6 amps max., 5VDC (±0.25V) 0.8 amps max. Unit as pictured at left (does not incl. case, power supply or cables). 30-page data book included. Weighs 3½ pounds. Size: 5¾"W x 8"D x 3¼"H

Limited Quantity!



Part No.		Price
FD200		$179.95
Single-sided, 40 tracks, 250K bytes capacity		
FD250		$199.95
Double-sided, 35 tracks, 438K bytes capacity		

Siemens 8" Floppy Disk Drive

- Single-Sided
- 77 Tracks
- 400/800K Bytes Capacity
- Industry Standard

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Part No.		Price
FDD100-8	Buy 1 for	$269.95 each
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JE664-ARS EPROM Prog. w/JE665 Option **$1195.00**
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EPROM JUMPER MODULES — The JE664's JUMPER MODULE (Personality Module) is a plug-in Module that pre-sets JE664 for proper programming pulses to the EPROM & configures EPROM socket connections for that particular EPROM

Part No.	EPROM	EPROM MANUFACTURER	PRICE
JM08A	2708	AMD, Motorola, National, Intel, TI	$14.95
JM16A	2716,TMS2516	Intel, Motorola, National, NEC, TI	$14.95
JM16B	TMS2716	Motorola, TI (+5,-12, +12)	$14.95
JM32A	TMS2532	Motorola, TI	$14.95
JM32B	2732	AMD, Fujitsu, NEC, Hitachi, Intel	$14.95
JM64A	MCM68764, MCM68L764	Motorola	$14.95
JM64B	2764	Intel	$14.95
JM64C	TMS2564	TI	$14.95

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8 Chips — 51 Minutes

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Erases 2708, 2716, 2732, 2764, 2516, 2532, 2564. Erases up to 8 chips within 51 minutes (1 chip in 37 minutes). Maintains constant exposure distance of one inch. Special conductive foam liner eliminates static build-up. Built-in safety lock to prevent UV exposure. Compact — only 9.00" x 3.70" x 2.60". Complete with holding tray for 8 chips.

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- 10 yrs. cont. duty at 20°C
- 115V 50/60Hz

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*PWS2107F	New	$14.95 ea.

Muffin-style Fan

- 105cfm free air delivery
- 4.68" sq. x 1.50" depth.
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- 115V 50/60Hz 14W Wt. 17 oz.

*Metal Frame

MU2A1-U	Cleaned & tested (used)	$9.95 ea.
*MU2A-1N	New	$14.95 ea.

Circle 41 on Reader Service card.

CALENDAR

Southcon/83: Electronics in the South

Southcon, the Southeast's largest high technology electronics exhibition and convention, will take place January 18-20 in the Georgia World Congress Center in Atlanta.

Southcon/83 is aimed at electronics professionals and will feature high technology products and services, including small computers, peripherals and data communications. Over 300 exhibitors are expected to participate.

For information, contact Jerry Fossler or Kent Keller, 213-772-2965.

New Jersey Microcomputer Show

The NJ Microcomputer Show and Fleamarket will be held on Saturday, January 22, from 10 a.m. to 5 p.m., at the Holiday Inn (North), North Passenger Terminal of Newark International Airport, Newark, NJ (Exit 14 of the NJ Turnpike).

This show will include commercial exhibitors and an indoor fleamarket area. Hardware, software and accessories for all popular systems will be featured.

For additional information contact Kengore Corporation, 3001 Route 27, Franklin Park, NJ 08823. 201-297-2526.

CP/M '83 in San Francisco

CP/M, an exposition and conference for the CP/M industry and users, will take place January 21-23 at Moscone Center in San Francisco.

CP/M '83 is sponsored by Digital Research Inc., and features manufacturers, independent software developers, OEM's, venture capitalists, software publishers, distributors, dealers and users.

For more information, call or write Northeast Expositions, 822 Boylston St., Chestnut Hill, MA 02167. 617-739-2000.

1983 Federal Software Conference

The 1983 Federal Software Conference will take place January 12-14 at the Sheraton Hotel, Washington, DC.

The Conference will focus on policy directions and trends affecting the development, acquisition and use of software by the Federal government. More than 40 experts will address the Conference.

For information, contact U.S. Professional Development Institute, 12611 Davan Drive, Silver Spring, MD 20904, 301-622-5696.

International Winter Consumer Electronics Show

The 1983 International Winter Consumer Electronics Show will be held Thursday, January 6th through Sunday, January 9th at the Convention Center in Las Vegas, Nevada.

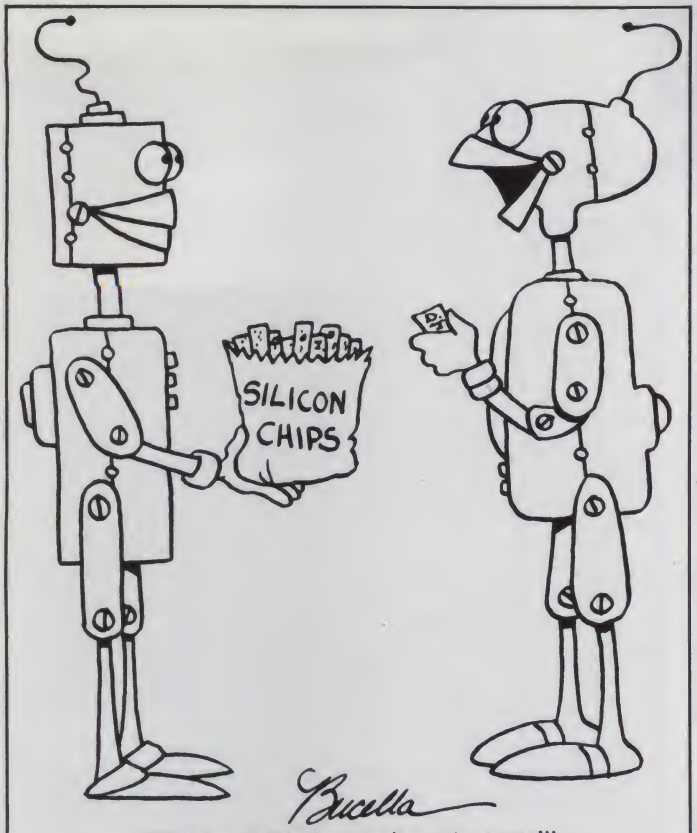
The first three days will concentrate on consumer electronics and the economy, audio developments and marketing, and video hardware and software. Sunday will be mainly devoted to computers and video games.

Computer-Aided Design Conference

CADCON 83, the first national computer-aided design conference, will take place January 17-19 at the Disneyland Convention Center, Anaheim, California.

There will be a large exhibit of computer-aided design systems and a technical program including seminars, workshops and the presentation of about 60 technical papers. The conference should be of special interest to design and manufacturing engineers.

For further information, contact Robert A. Poggi, CADCON Conference, Morgan-Grampian Exposition Group, 2 Park Ave., New York, NY 10016. 212-340-9700.



"They're right. You can't eat just one!"

MICRO QUIZ

Analysis of Algorithms

Find the maximum integral value of C for which the final value of A will be less than 2000.

```
READ A,B
DATA 1000, .1
FOR S = 1 TO C
D = A*B
A = A + D
NEXT S
END
```

(continued on page 154)

CLASSIFIEDS

Classified advertisements are intended for use by persons desiring to buy, sell or trade used computer equipment. No commercial ads are accepted.

Two sizes of ads are available. The $5 box allows up to 5 lines of about 35 characters per line, including spaces and punctuation. The $10 box allows up to 10 lines. Minimize use of capital letters to save space. No special layouts allowed. Payment is required in advance with ad copy. We cannot bill or accept credit.

Advertising text and payment must reach us 60 days in advance of publication (i.e., copy for March issue, mailed in February, must be here by Jan. 1). The publisher reserves the right to refuse questionable or inapplicable advertisements. Mail copy with payment to **Classifieds, *Microcomputing*, Peterborough, NH 03458**. Do not include any other material with your ad.

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Altos, Eagle and M/ACOM-OSI business computer specialists. Serving greater Los Angeles area with all your business computer needs. In-house service, custom programming, terminals, printers, etc. Open 9 AM-6 PM. **Computer Challenge Corp., 3380 Flair Drive, El Monte, CA 91731. 572-7292.**

Aurora, IL

Full line of Apple Computers and software. Hewlett-Packard Personal Computers, Calculators and Supplies. IDS Prism, SMC and Daisywriter Printers. **Farnsworth Computer Center, 1891 North Farnsworth Ave., Aurora, IL 60505 (851-3888) and 383 East North Ave., Villa Park, IL 60181 (833-7100).**

Akron, OH

Atari video game authorized independent servicenter. Games serviced by factory trained technicians. Fast turnaround. Dealer inquiries invited. We stock genuine Atari game and joystick parts. **Greensburg Electronics, 2618 Massillon Road, Akron, OH 44312. 644-3178.**

Nokomis, FL

We are the leading area computer store. We carry Cromemco, Apple, Vector Graphic; printers and terminals. We offer full software support including G/L, A/R, payroll and word processing. **Computer Centre, 909 S. Tamiami Trail, PO Box 130, Nokomis, FL 33555. 484-1028.**

Farmington Hills, MI

Microcomputer CP/M systems and database software for business applications. Integrated, customized and supported by a "computer whiz" MBA. For professional, quality service contact **Bruce Sherman, 24989 Woodridge Triangle, Farmington Hills, MI 48018. 471-4984.**

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Medical microcomputing software for the Apple and IBM Personal Computers. Thoroughly tested in major medical centers. Programs for cardiac catheterization, echocardiography, OB ultrasound, intensive care. **Trinity Computing Systems, 1020 Holcombe, Suite 408, Houston, Texas 77030. 790-1894.**

Dealers: Listings are **$15** per month in prepaid quarterly payments, or one yearly payment of **$150**, also prepaid. Ads include 25 words describing your products and services plus your company name, address and phone. (No area codes or merchandise prices, please.) Call Michelle at 603-924-9471 or write *Microcomputing*, Ad Department, Peterborough, NH 03458.

ZX81/TS1000 Users: Free newsletter and software available from Z-WEST User's Group. No SASE, no money—just your name and address. Write us at PO Box 2411, Vista, CA 92083.

Used Heath H-8 memory board, I/O card, terminal, software and complete H-8 system. Ten to 50 percent off list price. Send for free listing. D. Wong, Box 406, Croton Falls, NY 10519.

For sale: SDS 64K ExpandoRAM Board, 150ns, Bank Select, Write Protect, S-100—$425; Processor Tech 3P+S IO Board, S-100—$150; DRC 16K Eprom Board, S-100—$175; call Bill at 415-665-4959.

For sale: RCA VIP microcomputer, 4K RAM, Tiny Basic ROM board, 3.5 amp power supply, video mod., documentation—$125. Michael Groh, 1 S. 155 Valley Road, Lombard, IL 60148; 312-620-1345.

ZX-81, 16K programs galore, games, adventures, utility and business, about 20 program-crammed cassettes in English, with manuals; genuine offer; think big; think worldwide. Send $1 for catalogue or send $5 for sample cassette (about 50K) to Mr. W. Denissen, PO Box 342, 5000 AA Tilburg, Holland.

For sale: Apple compatible hardware perf. Franklin Ace 1000 $1100/Pineapple $700 Xerox 820 w/2 drives $2600/MPI Disk Drives w/o case $250, w/case $275/Rana Disk Elite One $359/Shugart 400 $339/Shugart 390 $299/Zenith 12" monitor $114/USI 12" monitor $175/Trendcom 100 $269/Epson MX80FT $540/OPUS Diskettes 20 for $39. Call Dennis 213-926-9854/Pat 714-586-3175.

For sale: 2 used SWTPC MP8m memory boards, $125 each; 1 new bare MP8 with support chips & 4K memory, $75; or all three for $275. John Price, 1804 Ave. V, Lubbock, TX 79401, 806-744-6484 after 8 p.m. Central Time.

Mucho Memory from Memopak Increase Your Atari's Memory Monitor with the Most

Memopak

Expand the Memory of your ZX-81 to 64K

The Memotech Memopak expands the ZX-81's memory to 64K bytes. The memory is well designed and worth its price of $179.95. The case is only 3/4-inch thick and is made out of black extruded aluminum, which acts as a heat sink. It plugs directly into the ZX-81 expansion port. The female connector is gold plated to assure a firm contact.

The Sinclair expansion port is brought out at the rear of the Memopak to permit use of other Sinclair peripherals. Instead of using an external power supply, it takes the 5 volts DC right off the computer edge card. Unlike most memories the power consumption is a mere 100 mA.

The Memopak is supplied with Velcro tabs which you affix to the rear of the ZX-81. The Memopak is well documented and a theory of operation is provided.

Memory Layout

Upon powering up the computer, you will have 16K of RAM. Two short software commands which allow you to select either 32K or 48K of memory are shown in the manual. Located in the rear are four Dip switches which allow the user to select various blocks of memory, some of which cannot be accessed by other memory packs.

In one switch position it will allow 64K of RAM to be used. This is for use with other machines, although they do mention that technical and interfacing experience is required. No matter how much memory you are using, a full check of memory is taken by the computer on power up.

When Sinclair Research developed the ZX-81, they left the 8K to 16K portion of memory to be a direct mirror image of the 8K ROM. Once decoded for use, this becomes an excellent place to store machine code that will not be overwritten. Although in most memories this would be impossible, it is not so with the Memotech Memopak. Again, using the Dip switches you can use this 8K area with machine code.

Most of the system variables, such as the Display File and the Entry Line, are kept in the 48K to 64K memory area. This allows the 16K through 32K block to be used for Basic or machine code programming. It might seem a bit strange to spend extra money on this memory when all you get is 16K, but this is not the case. All strings and variables are held in the 32K to 64K block; however, it is also possible to store machine code by using Peeks and Pokes. The 16K block is used mainly for text. This feature alone makes it well worth the price. In most systems, 2000 or more bytes are taken up just by strings.

Purchasing the Memotech Memopak 64K pack will allow you to use the Sinclair for bigger and better programming needs. *(Memopak is marketed by the Memotech distributer in Denver, CO, and by Gladstone Electronic, Inc., Buffalo, NY. $179.95)*

David M. Fisher
Flushing, NY

Mosaic 16K/32K Board

Snap this board in Place and increase Your Atari's memory

Whoever it was that said elephants never forget would certainly be impressed by the memory capabilities of the modern-day microcomputer. Barring power failures, glitches and sloppy programming, the computer never forgets. Not only that, but it can increase its memory capacity with the snapping in of a board.

Mosaic Electronics markets a 16K memory board which is electronically equivalent to the Atari 16K RAM board, with one important difference. Extra Dip plugs have been provided to hold additional memory chips. The 16-page manual explains the installation procedure for the Atari 400. I own an Atari 800, so this was not particularly helpful.

A new installation guide which will include instructions for the Atari 800 is forthcoming. However, after a phone call to Mosaic, I was able to install the board. As for the Atari 400 instructions, they include good photographs and step-by-step instructions.

There is a bit more to installation than snapping a board in place, but not much. First the Atari 16K RAM board is removed and its chips are positioned on the Mosaic board. This gives the Atari 400 user 32K of RAM with which to program. When you put the new board back into the computer, it must face a certain direction (electronic parts toward the back) as shown on the board and in the instructions. For the Atari 400 user, that's practically all there is to it.

However, if an Atari 800 user plugs the new board in and types PRINT FRE(0), he will find, as I did, that there has been no increase in memory size. This is because the operating system cannot see the extra memory unless the Mosaic board is used with an Atari 8K or 16K board, or the Mosaic companion board. The memory is there, and you can poke to it, but Basic won't allow programs or variables to reside there. The solution is to install the companion board ($5 from Mosaic), which results in a true 32K system.

It is a simple matter to add 4116 memory chips, bought separately, directly to the Mosaic 16K board and use the Atari 16K RAM board instead of the companion board. This will bring the system up to 48K. You can let Mosaic do it for you and use their 32K RAM board with the Atari 16K RAM board. The Mosaic 32K RAM board is identical to their 16K board, except that all of the chips are already in place.

Once installed, there was no trouble

with reduced screen clarity. Another good point: the board comes with a four-year guarantee.

Mosaic Electronics has provided the Atari user with a reliable (gold edge connectors) memory-expansion alternative. It is also quite flexible. Using the Mosaic 32K board to expand the Atari 800 to 48K still leaves one slot available for other applications. Also, the Mosaic boards are bus-compatible. *(Mosaic Electronics, PO Box 748, Oregon City, OR 97045; 16K Board $119.95; 32K Board $159.95)*

Bruce Douglass
Doris Minnerath
Vermillion, SD

Zenith Green Screen

A quality Monitor at an Affordable price

If you have one of the older generation micros like the Apple or the TRS-80, you might be looking around at the new green or amber monitors on the market. If you're like me, you can't afford one.

One monitor that's being sold and is within my price range is the Zenith Green Screen Monitor (ZVM-121). My TRS-80 had a previous owner and I needed to get it a video companion; the prices looked tempting (list price $159).

I compared the monitor with the Amdek/Leedex 100. In comparison, the Zenith did pretty well. It seems to me that the Zenith monitor was designed specifically to compete with the 100 due to the similarity of layout and quality.

The Zenith monitor, like the 100, has a bit of hum in the horizontal sweep. You'll see it as a slightly shaded bar that runs up from the bottom when you adjust the brightness and contrast to bring up the raster.

The hum isn't discernable at normal brightness and contrast for text use. The only time it may cause problems is when the screen is displaying large blocks of graphics and is being photographed at a one second exposure.

I mention the photographic situation because I've used my micro to do some experimental film animation. The hum is due to the difference in frequency between the AC power line and the vertical frame rate generated by the computer's video generator. Most of the monitors I've tested have this minor problem in varying degrees. For most purposes and users, the hum is absolutely no problem.

Resolution of the monitor is very good for the price. Characters are clear, with each dot visible and no ringing, ghosts or smear evident. Linearity is just a little off; the characters on the left side are just a bit larger than on the right, but you have to look hard to see it.

Brightness and contrast are controllable on the front and there is plenty of latitude to set up the monitor to your liking. One test I did which won't affect most users was to check out the gray scale capabilities of the Green Screen. I put some regular broadcast standard video into the monitor and there was some luminance (brightness) compression.

For the typical TRS-80 or Apple user there won't be any problems due to the brightness compression, because graphics on those machines are either full on or off with no grays. Users with frame grabbing equipment probably should use another monitor.

One feature of the Green Screen that is handy is the 40/80 character display switch on the back. In the 80-character position, it shortens the sweep to display all 80 characters. Next to the switch is a width control that adjusts the 80-character display. In the 40-character position, the width is fixed.

Horizontal and vertical hold controls are on the back. The horizontal and vertical sweep circuits are very stable and I found that on a number of different computers I didn't need to readjust the controls. When the computer driving the monitor is turned off, the monitor doesn't sing. The horizontal sweep circuit doesn't self-oscillate or whine when the screen is filled with large areas of green, so the monitor is unusually quiet.

On the subject of glare, the Green Screen has the same problems as every other monitor. It doesn't come with an anti-glare filter and reflections on the faceplate can be annoying. I've set up the lighting at my desk so that it is all indirect, avoiding the glare problem completely. If you can't get your operating area completely glare-free, the green display does have a bit of an edge over the typical white display, glare on the screen usually being white.

Physical characteristics of the monitor: weight, six pounds; shipping weight, about 15 pounds; polarized two-prong AC plug and power switch on the front. For the interior decorators, the case is beige, the screen is about 12 inches diagonally and the right side has an old-gold colored panel that's big enough to hold a 5¼-inch floppy disk drive. An operating manual comes with the unit; a schematic and service manual can be bought at your local Heathkit store.

Overall, the Zenith Green Screen Monitor, ZVM-121, is a good buy. As a replacement for the stock TRS-80 monitor, it is a definite improvement. In those cases involving gray-scaled graphics, slow-scan TV or frame-grabber applications, I would suggest another monitor. I have found that for most of my keyboard pounding and game playing, it's perfect. *(Zenith Data Systems, 1000 Milwaukee Ave., Glenview, IL 60025. $159.)*

Miles William Wade
Dallas, TX

Try Nailing Jelly To A Tree
Examine Extent of Computer Competence
A Pair of Basic Guidebooks
Uncovering VIC's Darkest Secrets

Nailing Jelly To A Tree

Jerry Willis and William Danley, Jr.
dilithium, 1981
PO Box 606
Beaverton, OR 97075
Softcover, 244 pp., $15.95

If the title of this book is designed to attract attention, it did its job well. At least in my case it did. I *had* to pick it up to find out what it was all about and I ended up taking it home.

Nailing Jelly To A Tree is intended for computer owners who are just getting started. Authors Jerry Willis and William Danley assume the reader knows how to operate his computer—and little else. It's a beginner's guide to assembly-language and Basic programming; the authors say they picked the title because "learning about software is like nailing jelly to a tree."

I'll have to agree. I've been writing assembly-language and Basic programs for about six years and I'm still not sure whether I know what I'm doing.

The book begins by describing what you can expect to gain (a basic understanding of microcomputer programming) by reading it. Chapter 2 is a short tutorial on binary, octal and hexadecimal number systems, gates, and ASCII character coding. This includes a discussion of why these subjects are important and how they relate to programming.

Chapter 3 is a discussion of various terms and types of software and how they relate to the microcomputer. Languages such as assembly, Basic, Fortran and Pascal are included. Monitor programs and how they are used to control the operation of a computer are explained.

The TRS-80, the Sorcerer, SOL and Northstar are used in the descriptions in Chapter 3. The book is dated a bit by the inclusion of SOL material, but the information is still relevant. My first computer was a SOL and, except for a lack of graphics and speed, there wasn't anything it couldn't do that the newer ones can.

Chapter 4 starts instruction of assembly-language programming by using as examples three of the more popular microprocessors—the 8080, Z-80 and 6502. The discussion starts out by describing the architecture of these chips. Accumulators, registers, counters and flags are the main subjects covered.

The use of an editor/assembler is described in chapter 5. The writing, editing and assembling of a sample program is explained using the TRS-80 as an example.

No one is going to emerge from chapters 4 and 5 as an accomplished assembly-language programmer. But the information presented might help to shed a little light on what assembly-language programming is all about and what its advantages and disadvantages are.

Basic programming instruction is covered in chapter 6. Various versions of Basic and some of the more common Basic statements are explained. Methods for entering programs and for getting information into and out of the computer are the major subjects of discussion.

Chapter 7 continues the Basic instruction by discussing in detail the more complex Basic commands, statements and functions. Decisions, comparisons and loops are some of the items covered. A blackjack game is used as the medium of instruction.

The book closes with different methods of converting programs from one version to another. Commands, statements or functions used for conversion are presented, along with ways to program around an unavailable element.

A glossary of terms used in the more popular Basic languages is provided, along with a binary-octal-hexadecimal-decimal conversion table.

It takes a fairly long time to write a book manuscript and get it published. Unfortunately for authors, the microcomputer field is growing and changing so rapidly that anything written today is out of date tomorrow. The basic information given in *Nailing Jelly To A Tree*, however, is relevant to any computer.

Still, no one is going to learn how to program proficiently in assembly language or Basic by reading any one book. Nothing is covered in any depth in *Nailing Jelly To A Tree*, but then it would have been hard to include as many subjects in one book as the authors have and do any one of them justice.

Rod Hallen
San Francisco, CA

Taming Your Computer (A Guide for Business And Professional People)

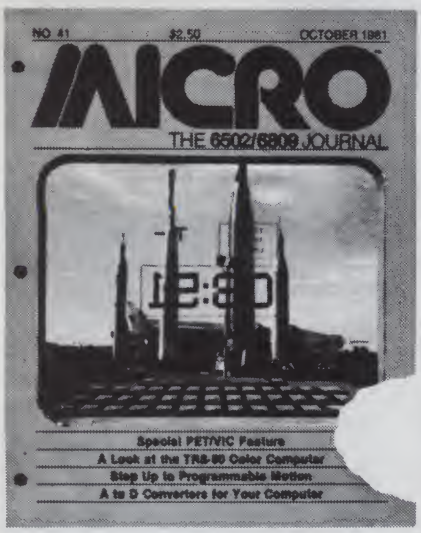
Jerome Kanter
Prentice-Hall, 1981
Englewood Cliffs, NJ 07632
Hardcover, 246 pp., $17.95

Like doctors and lawyers, computer professionals belong to a cult. Cult members are privy to information outsiders want to obtain. To an extent, cult members can keep the cult's secrets within the fraternity, but their behavior cannot be effectively questioned or controlled by those they ostensibly serve.

Jerome Kanter's *Taming Your Computer* is addressed to one category of outsiders—top management. The message is: Read this book and you will learn the secrets of the cult; once the cult has been demystified, you can gain control of your EDP department and make the computer your servant.

In my local bookstore, alongside shelves containing the popular books on lawyering and doctoring, there is now an equally large area devoted to allegedly painless and easy-to-understand introductions to computers—especially computers in business. There is, evidently, an insatiable market for such books, but the definitive computer primer has yet to be written. Kanter's book is clearly not a candidate for that title.

A feast of computing ideas.



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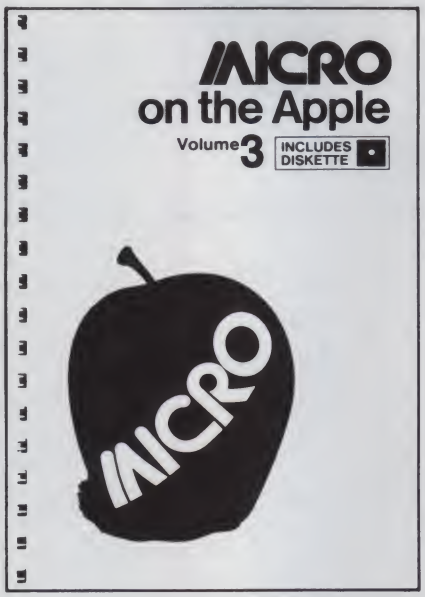

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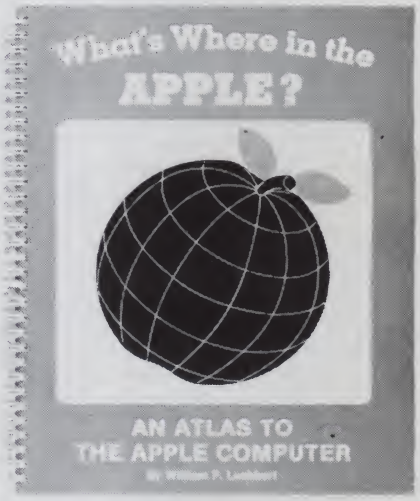

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- Helps BASIC users to speed up their programs.
- Enables assembly language programmers to simplify coding and interfacing.

All Apple users will find this book helpful in understanding their machine, and essential for mastering it!

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MICRO, Dept. OA, P.O. Box 6502, Chelmsford, MA 01824.

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Taming Your Computer is no joy to read. It is often bland, boring and/or jejune. Technical terms are sometimes not defined when they are introduced. The technical descriptions are typically accurate (although in one instance, bits and bytes are carelessly confused), but they're generally insufficient.

Occasional lapses in grammar or diction are annoying. Continuity is sometimes lacking, presumably because the book is an update of an earlier work (under a different title) by the same author. The stitches clearly show where the new materials (sometimes statistics, press releases and previously-published articles by the author and others) have been inserted.

Although various sources are quoted or referred to in support of the author's arguments, there are almost no footnotes (although there is an incomplete bibliography). Many statistical presentations—some of them very significant, if true—are totally unsupported.

Finally, Kanter tries to cover a huge amount of material in a very small space (paradoxically, he frequently manages to be repetitious). The result is a mere catalogue of ideas and a proliferation of typologies rather than a meaningful explication. Indeed, it would require a miracle worker to discuss adequately, in 246 pages of large print, the history of computers, computer applications, mini- and microcomputers, COBOL programming, software and hardware, operations research, management information systems, teleprocessing and the future of computers.

However, just as there is some good in every juvenile delinquent, there are also some good ideas in every bad book. Here are a couple (not necessarily original or correct ones) from Kantner's:

1—The Peter Principle, which holds that organizational employees are eventually promoted to their level of incompetence, can be applied to computers. That is, when computers succeed at workaday tasks (such as payroll and inventory), their masters give them more responsible jobs—until computers also reach their level of incompetence.

2—During the Industrial Revolution, the business of the typical entrepreneur was integrated; after all, it was all in one head. But with the growth of the corporate form of organization, functional boundaries have developed, fractionating the typical business.

The computer is usually under the control of the accounting department because the functions of that department were among the earliest to be computerized. However, it is becoming increasingly apparent that the computer can succeed at more demanding tasks, such as contributing to the strategic planning of top management.

Indeed, the computer, with the establishment of a common database and through its control of data flow, can be used to reintegrate the various corporate subsystems. This, says Kanter, should be one of management's highest priorities.

There is a large potential for conflict between these two principles, which Kanter, to his credit, acknowledges—at least implicitly. On one hand, he exhorts management to use the computer to its full potential—in operations research, forecasting, strategic planning and the like. He urges the expansion of computer usage in all areas of our lives—in medicine, for example.

> How do we know when the computer has reached its level of incompetence?

On the other hand, he concedes that some projected uses for computers are visionary, such as brain surgery. The unanswered question, which Kanter does not address, is: How do we know when the computer has reached its level of incompetence?

Like its human counterpart who *has* reached his level of incompetence, the computer will typically not have its feet of clay revealed until it has committed some colossal error—possibly with a substantial loss in both material and human terms.

The computer, like so many of the technological marvels that have appeared since the Industrial Revolution and which have enriched our lives, also has a significant negative potential which probably has not received sufficient attention thus far.

Allan Blackman
New York, NY

Basic BASIC-English Dictionary

Larry Noonan
dilithium, 1982
11000 S.W. 11th St.
Beaverton, OR 97005
Softcover, 148 pp., $10.95

The Basic Conversions Handbook

The Brain Bank
(David A. Brain, et al)
Hayden, 1981
50 Essex St.
Rochelle Park, NJ 07662
Softcover, 79 pp., $7.95

One of the more frustrating aspects of Basic is that there is really no standard Basic language. There are as many different dialects of Basic as there are microcomputers using it.

If you own an Apple, for example, reading a listing of a TRS-80 program is like hearing a joke where the punch line is in a foreign language—you understand everything except the important part. Before you can get that TRS-80 software to run on your Apple, you first have to learn enough of the TRS-80's dialect to be able to make the necessary translations.

Obviously, there's a lot of demand for some kind of Rosetta stone to make this process less painful. One response has been the release of *Basic BASIC-English Dictionary* and *The Basic Conversions Handbook*, both of which are intended to operate something like an English/foreign language dictionary, except that in this case the "languages" being compared are different dialects of Basic.

The books cover the same computers (Apple, PET and TRS-80), but their approaches are quite different. *The Basic Conversions Handbook* reminds me of one of those pocket foreign language phrase books; each chapter is a listing of keywords; the left column contains the keywords from one dialect of Basic and the right column has appropriate translation. It compares only two dialects at a time; for example, one chapter shows you how to convert Apple programs to the TRS-80, while the next may show you how to translate PET to Apple. This straightforward format makes it quick and easy to use.

Basic BASIC uses an entirely different system as it is actually two books in one; besides being a translation book, it is a dictionary of Basic keywords. For example, under the heading "SYS" you will find a short explanation of what SYS means and how to use it, followed by specific instructions for each computer, including any necessary translations. (In this case, the Apple uses CALL or USR, and the TRS-80 uses USR).

This system provides the advantage of more information about the keywords and their use. In addition it allows you to compare all the dialects simultaneously. However, as far as making an actual line-by-line translation of a program, it is inherently slower than *Basic Conversions*.

Another difference between the books is that *Basic BASIC* has more in the way of appendixes, including a table comparing the ASCII codes of the three computers and a short introduction to the graphics available on each. The information *Basic Conversions* has on these subjects is somewhat limited by comparison; you'll have to decide for yourself whether the additional information in *Basic BASIC* is worth the added cost to you.

Which book is better? Well, if you already own an Apple, PET or TRS-80 and are comfortably proficient in Basic, and if you have a stack of programs that you'd like to convert to run on your machine,

then *Basic Conversions* provides the most direct route for doing it.

If you own some other brand of micro and want to learn about the Apple, PET or TRS-80 to try converting their programs to run on your computer, or if you just want to know more about the Basic language, then *Basic BASIC* is probably the better choice.

Bill Lukeroth
Martinez, CA

The VIC-20 Programmer's Reference Guide

Andrew Finkel, Neil Harris, Paul Higginbottom and Michael Tomczyk
Howard W. Sams and Co., 1982
4300 West 62nd St.
PO Box 7092
Indianapolis, IN 46206
Comb binding, 289 pp., $16.95

Owner's manuals are too often incomplete and don't begin to show the owner all of the potential his computer has.

That's where well-written reference guides come in.

The VIC-20 Programmer's Reference Guide specifically addresses the needs of both Basic and assembly-language programmers. Tips for beginners as well as for seasoned programmers are included; the user is shown how to make his computer really come to life.

The VIC owner's manual, for example, mentions that joysticks can be connected and used on your own programs, yet it leaves the reader in the dark as to how this is done. *The VIC-20 Programmer's Reference Guide* shows how external joysticks, as well as paddle controllers, light pens, and other peripherals, can be accessed.

Eleven pages are dedicated to the subject of accessing VIC's three-tone generators. The sound creation of both music and special effects are covered in detail.

A section on Basic programming supplements the owner's manual. Sample programs are provided to help clearly explain concepts and reserved word operations.

Included in the book's 289 pages is a thorough coverage of the use of high-resolution color graphics. Accessing machine-language subroutines from within Basic programs also is demonstrated to allow ease of writing in Basic with the speed of assembly routines.

A very tutorial attitude is taken in the presentation of assembly-language programming. This section discusses such topics as system overviews, block diagrams, memory maps, 6502 instruction sets, addressing modes and the microprocessor's internal registers. Conversions between hexadecimal and decimal are described as well.

In order to get the full benefit from the assembly section of the book, the reader must have the VIC machine-language monitor cartridge for his computer. This enables him to edit and assemble machine-language programs.

Several pages in the manual provide listings of useful memory locations. Included in these are addresses where Basic stores variables, arrays and the like.

A comprehensive appendix contains about a dozen excellent reference charts. Appendix I offers suggestions for readers who want to convert Basic programs written for other brands of machines to the VIC. Other appendixes deal with input/output pins, connections for peripherals, ASCII codes, error messages, mathematical functions and screen maps. An impressive foldout schematic is pasted on the inside back cover.

Whether the VIC owner is a novice or an experienced programmer, he will find material in this book that exposes the darkest secrets of this computer.

Dan Keen
Bob Kenney
Cape May Court House, NJ

NEW SOFTWARE

Edited by Dan Muse

Computer Instruction for the Handicapped

Computer instruction for the mentally handicapped is now available from The Upper Room Computer Consultants. Colorful animated graphics programs, utilizing synthesized speech, teach basic counting and word recognition skills to those with learning disabilities.

The software is available for the Apple II Plus, Atari 400/800, Texas Instruments 99/4 and 99/4(A), and the VIC-20.

Reading is not required unless it is part of the learning objective. The programs are available on tape or disk for $29.95. The Upper Room Computer Consultants, 907 6th Ave. East, Menomonie, WI 54751. Reader Service number 495.

Quick-Search Librarian

Quick-Search Librarian is a database software package that keeps track of technical references and journal articles. The program is designed for the Apple II Plus.

Articles can be cross-referenced with up to 12 keywords. Only two keystrokes are needed to select any one of 255 user-defined keywords or journal titles. You have the option of entering the complete journal reference, list of authors, title and comments for each article. Quick-Search Librarian has a powerful screen editor which allows easy editing by means of a variety of simple commands.

Typical search speed is 50 articles per second, even for complicated 16-parameter search expressions. Sorting speed is 40 articles per second for concurrent sorting on three different fields. Information for up to 1000 articles may be stored on a single disk.

The Quick-Search Librarian costs $75; the instruction manual may be purchased separately for $5. Interactive Microware, Inc., PO Box 771, State College, PA 16801. Reader Service number 482.

Lazycoder Screen

Lazycoder, from Nelson Data Resources, Inc., lets you use your screen as an electronic blackboard to design images or data entry screens, using any of 35 built-in design functions.

Once you have designed a screen you can print it, generate a complete Basic file maintenance program using the screen for data entry, put screens together into a "slide show," create computerized educational aides or help systems, or use the filing system option to enter and retrieve information. Lazycoder Screen is designed for the programmer, educator, manager, salesman, artist and others.

Lazycoder is available at an introductory price of $125. Nelson Data Resources, 900 South 74th Plaza, Suite 118, Omaha, NE 68224. Reader Service number 480.

MoneyTrack

MoneyTrack, for the IBM Personal Computer, has the capacity to maintain complete transaction records for small businesses, farms or investments as well as the owner's personal accounts. The package prepares a variety of reports to help meet the requirements of financial institutions and the Internal Revenue Service, prints check forms and greatly simplifies the job of bank reconciliation.

MoneyTrack comes with its own operating system, so it is ready to use as soon as the disk is inserted in the computer's disk drive. No knowledge of programming or computers is needed.

MoneyTrack sells for $450. Pacific Data Systems, Inc., 6090 Sepulveda Blvd., Culver City, CA 90230. Reader Service number 488.

Quick Brown Fox Software

Quick Brown Fox software, for the VIC-20 or Commodore 64, features full-line and global edit capabilities, text moving, boilerplating, tab and margin settings, right justification and proportional spacing.

With Quick Brown Fox, you can edit even with the VIC-20's standard 22-column width; this is not possible with most other software.

Quick Brown Fox strategy is to develop a complete work station (including letter-quality printer and 80-column board) for less than $2000. The Quick Brown Fox word processing package sells for $65.

Quick Brown Fox, 548 Broadway, Suite 4F, New York, NY 10012. Reader Service number 487.

VersaForm

Applied Software Technology has announced that a version of VersaForm is now available for the IBM Personal Computer. The IBM version shares a standard VersaForm user interface. Identical command structures, reporting procedures, screen display formats and file maintenance routines allow existing VersaForm users to implement their form templates on an IBM PC without modification.

VersaForm, a forms processing database, is specifically tailored to handle common business forms associated with most business operations. Utilizing the familiar structure of paper forms, the system allows an office worker to process a form on a video display, then format and print the data on preprinted paper forms.

The IBM PC version, compiled under version IV.0 of UCSD Pascal, implements several hardware features of the IBM system. Multi-mode reverse video for easier data entry, full-function key support to speed command selections, the use of floppy disk drives of up to 400K bytes per disk for increased data storage capacity and the utilization of main RAM memory as a logical disk drive are standard features of the IBM PC version.

VersaForm for the IBM PC sells for $389. Applied Software Technology, 14125 Capri Drive, Los Gatos, CA 95030. Reader Service number 484.

Kaleido-Sound

Passport Designs has announced the release of Kaleido-Sound, a real-time graphics program that synchronizes to any audio input.

The audio signal from a stereo, cassette player or a sound system can be plugged into the Apple II cassette port to drive four different kaleidoscope patterns, each with a selectable color scheme. The full-color kaleidoscopes change color, pattern and location dynamically on a CRT monitor, television or video screen as the music changes frequency and loudness.

Kaleido-Sound is aimed at music listeners, computer hobbyists, game enthusiasts and others.

Kaleido-Sound costs $39.95 and is available from Passport Designs, Inc., 116 No. Cabrillo Highway, Half Moon Bay, CA 94019. Reader Service number 483.

Financial Management Models

PRO/PAC, Inc., has released a series of 11 VisiCalc financial templates called Financial Management Models for the Service Firm. Managers in such fields as engineering, advertising, architecture and consulting can use the Financial Management Models to determine billing rates, estimate fees, forecast cash needs, budget projects, etc.

The models are set up to be

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easily modified and adapted to the individual firm's needs.

A 175-page manual is included; each model is explained in detail and a glossary of key financial terms is included.

The Financial Management Models for the Service Firm package is available for the Apple III with 128K or Apple II Plus with 48K; it costs $295. PRO/PAC, Inc., PO Box 219000, Houston, TX 77218. Reader Service number 481.

Plato Courses

Control Data Corporation is offering nine educational courses for use on the Apple II Plus, Atari 800 and Texas Instruments 99/4A microcomputers. Plato computer-based education is an interactive method of self-paced, one-to-one instruction.

The first nine lessons to be offered are Basic Number Facts, Whole Numbers, Decimals, Fractions, Physics: Elementary Mechanics, French Vocabulary Builder, German Vocabulary Builder, Spanish Vocabulary Builder and Computer Literacy: Introduction. Some lessons cover elementary skills, while others address junior high or senior high school skills.

Initially, the software will be sold through the mail for $45 for a single lesson and $35 for each additional lesson. Control Data Publishing Company, PO Box 261127, San Diego, CA 92126. Reader Service number 492.

The IBM PC Primer Series

The IBM Personal Computer Primer Series uses the IBM Personal Computer to teach the functions, features and operation of the IBM Personal Computer. The package consists of six stand-alone, self-paced learning modules, or courses, each of which is easy to use. The six modules are Major System Components, Using the Keyboard of the IBM PC, Basic Computer Concepts, Using the Basic Language, The Disk Operating System (DOS) and Problem Determination.

The user will learn terminology and concepts that are basic to data processing, gain an ability to identify major components of the IBM PC, develop a short Basic program and perform various functions such as loading the DOS and copying disks.

In addition to the six course modules, the package contains a 143-page workbook. The price is $150 per course module. Multiple-purchase discounts, rental options and software maintenance service are available. Computer Systems Research, Inc., 195 West Main St., PO Box 45, Avon, CT 06001. Reader Service number 490.

C64 File

RAK Electronics has announced C64 File, a multipurpose database management system for the Commodore 64 computer. Minimum requirements for using File are a Commodore 64 and cassette deck. File will allow you to construct, sort, maintain, and print out a relatively wide range of data types.

Because of the user-specified record format, almost any project that requires record keeping can be handled.

File lets you load an existing file from cassette or start a new data file with the command load. Other function commands include dump, print, add, change, remove, sort and quit. C64 File is available for $9.95 (plus $2.00 shipping and handling) from RAK Electronics, PO Box 1585, Orange Park, FL 32073. Reader Service number 491.

Data Capture/PC

Southeastern Software has announced a telecommunications program for the IBM Personal Computer. The program, Data Capture/PC, can be used to communicate with mainframes, microcomputers, bulletin boards and any electronic information system without the need for complicated file transfer procedures.

Data Capture/PC can capture data from a remote system and send it directly to a disk file. The Capture Buffer can also print the data while

capturing it. The program can transfer a file and all or part of the Capture Buffer to a remote system. It can also prepare text for transmission at a later date.

Data Capture/PC was written to take advantage of the advanced features of the IBM PC. The program uses user-defined function keys for phone numbers, passwords or any frequently used command sequences.

Data Capture requires 64K RAM, a disk drive and asynch communication card or equivalent; it sells for $120. Southeastern Software, 7743 Briarwood Drive, New Orleans, LA 70128. Reader Service number 494.

Priorities

Big Island Computer Systems, Inc., has announced the availability of an upgraded version of Priorities, a productivity increasing tool for professionals and managers. The new version 1.11 has more printout options, is easier to use and is faster than the original.

Priorities 1.11 contains four sections: overdue tasks, appointments for the day, tasks for the day and high-priority tasks coming up. A Multi-Day report allows flexible reporting through the setting of several values: start date, end date, search string (client name, work type, etc.) and column format.

Priorities runs on 64K CP/M systems and is available on eight-inch, single-density disks. It costs $199. Big Island Computer Systems, Inc., PO Box 777, Pahala, HI 96777. Reader Service number 489.

InterCom

Articulate Publications, Inc., has announced the release of InterCom. InterCom is designed to integrate interactive communications into existing applications software; it enhances applications features and facilitates technical support using low-cost modem hardware.

For example, one version of InterCom, Medlink, allows medical billing microcomputers to support automatic, "paperless" processing of insurance claims. Using InterCom and modem hardware, doctors can submit claim information and make on-line inquiries about paid, pending, checkwrite and transmission information.

Accounting programs equipped with an InterCom version AccountLink can automatically call the company's bank and post deposits to the company's account. With InterCom's LegalLink, legal billing programs can tie the lawyer's office into several national legal databases. InterCom lets the lawyer use his microcomputer to perform valuable research in less time, without leaving the office.

InterCom runs on CP/M systems with 64K and is available on 5¼ and eight-inch disks.

For more information, including price, contact the InterCom division of Articulate Publications, Inc., 2210 Wilshire Blvd., Suite 409, Santa Monica, CA 90403. Reader Service number 494.

Shapes in Color

Shapes in Color is a Basic precision shape drawing program for the Apple II. The program lets you create and compile shapes that can be drawn on a medium-resolution grid in various colors, sizes and angles.

The program can be used to design shapes ranging from unique typography to animation. Shapes can be designed in the high-resolution colors of green, violet, white, orange, blue and black.

Graphics backgrounds can be "painted" with free-hand brushstrokes and then used with moving shapes to generate striking effects. Complete backgrounds and shapes are saved on disk to be reloaded for use in other programs. The documentation describes techniques for writing programs using the shapes and backgrounds you create.

Shapes in Color sells for $49.95 and requires an Apple II or Apple II Plus with 48K, one disk drive and color TV monitor. Hayden Software Company, 600 Suffolk St., Lowell, MA 01853. Reader Service number 485.

NEW PRODUCTS

Edited by Dan Muse

Printer Control Card

Optimal Performance has released a new aid to owners of popular micro printers. The Printer Control Code Reference Card provides a reference to control codes and reduces the time spent searching through owner's manuals.

The card shows decimal and hexadecimal codes needed to use all printer functions, as well as key sequences to input these codes directly from the Atari keyboard. The decimal and hexadecimal information is applicable to any computer system using the supported printers.

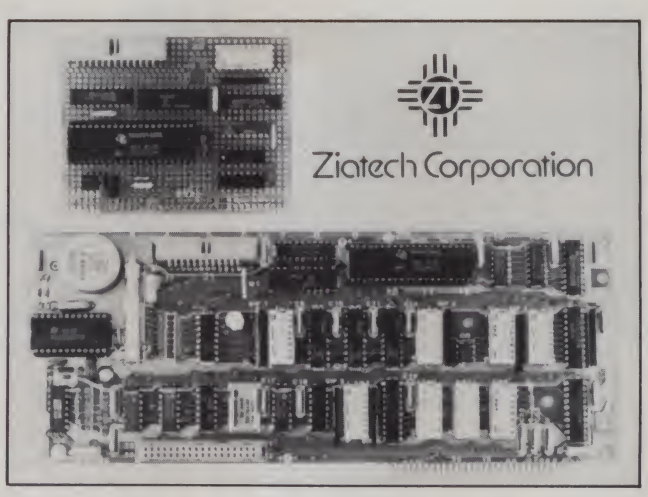
Control information is logically organized by printer function and provides cross-referencing which is useful for converting programs written for use on one printer to another.

Printers supported by the Optimal Performance Printer Control Code Reference Card include: Atari 825, Centronics 727, C. Itoh 8510A, Epson MX-80, NEC 8023A-C and others which use similar control code structure. The card is available from Optimal Performance, 14W Kappas Marina, Sausalito, CA 94965 for $3.50. Reader Service number 471.

ZT 1488

The ZT 1488 GPIB Interface allows IBM Personal Computer users to control IEEE 488 compatible test and measurement equipment with the Basic language. The controller/interface has a real-time clock/calendar and a socket for an optional (Multimodule) I/O board. This three-function capability fits into one IBM PC I/O slot.

The clock/calendar features a battery which ensures against loss of time from shutdowns up to two years in duration. User-programmable interrupts from the clock can be used to set measurement intervals and produce alarms for starting service routines.



The ZT 1488 multifunction GPIB interface from Ziatech Corp.

Basic language support is an important feature of ZT 1488. A test or measurement system can be designed, or changed, in Basic by noncomputer-oriented users. More experienced users can access the ZT 1488 using the driver subroutines supplied in the optional software package.

The ZT 1488 sells for $485. Ziatech Corporation, 3433 Roberto Court, San Luis Obispo, CA 93401. Reader Service number 475.

Avatar Terminal Converter

The Avatar TC1 Terminal Converter transforms any CRT terminal into a personal computer system that provides local processing, data storage and bidirectional data transfer functions.

The terminal converter features a universal data handler, CP/M disk conversion and ASCII file transfer utilities.

The TC1 requires no system modification and maintains complete CRT compatibility with the host CPU.

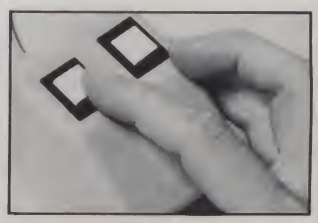
The Avatar TC1 Converter is equipped with 64K bytes of volatile and nonvolatile RAM and 4K bytes of EPROM. The converter is installed on-line between a CRT and host computer; single or dual 5¼-inch disks provide storage up to 410K bytes per drive. Options include a 20 mA adapter cable and parallel (Centronics-type) printer interface.

The Avatar TC1 Terminal Converter is priced beginning at $1795, depending on configuration and options. 3R Computers, 18 Lyman St., Westboro, MA 01581. Reader Service number 474.

MicroMouse

The MicroMouse is a reliable and rugged input device for microcomputers.

A mouse is a pointing device with two pushbutton switches on top. The pushbutton switches are used to initiate a computer action at the identified screen location. For example, in a word processing application, the cursor is moved over a letter in a word, and a button is pushed to delete that letter.



The MicroMouse is a rugged and reliable input device for microcomputers.

In a graphics application, a line is drawn by first moving the cursor to a location on the screen. The location is identified as the beginning of a line by pushing a button. Then the cursor is moved to another location and a button is pushed to identify the end of the line. The computer then draws a line between the two points.

The MicroMouse costs $180. 3G Company Incorporated, Rt. 3, Box 28D, Gaston, OR 97119. Reader Service number 473.

The Voice Box

The Voice Box is a low-cost, unlimited vocabulary, programmable speech synthesizer for personal computers. The Voice Box works with the Apple II and II Plus, and Atari 400/800 computers. The unit converts typed or stored text into speech and sound effects.

The Voice Box comes with disk or cassette pronunciation dictionaries for thousands of commonly used words and word fragments. The box can also be programmed for an unlimited number of pronunciations for unusual words, names, foreign languages and sound effects.

The Voice Box is available in two models. The AL-5001 for the Atari 400/800 is a small box that plugs directly into the serial port. It talks directly through your TV set and eliminates the need for special interfaces, external speaker, power supply or connectors. This model costs $169 and comes in disk and cassette versions; 16K and 32K programs are available.

The AL-3001 for the Apple II and Apple II Plus is a slot-independent card that includes a speaker and a ROM with standard pronunciation dictionaries to avoid having

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- ★ OS-9 Text Editor
- ★ OS-9 Assembler

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- ★ 128K Static Ram
- ★ 2MHz 6809 CPU
- ★ 19 MB 5¼" Winchester DMA Subsystem
- ★ 4 RS232C Serial Ports
- ★ 1 MB 5¼" Floppy Disk Drive
- ★ DMA Double Density Floppy Disk Controller

SOFTWARE FEATURES:

- ★ OS-9 LEVEL TWO Multi-User Operating System
- ★ OS-9 Text Editor
- ★ OS-9 Debugger
- ★ OS-9 Assembler

128KB MULTI-USER SYSTEM $6997.39

HARDWARE FEATURES:

- ★ 2MHz 6809 CPU
- ★ DMA Double Density Floppy Disk Controller
- ★ 128KB Static Ram
- ★ 2 RS232C Serial Ports
- ★ Dual 8" DSDD Floppy Disk System

SOFTWARE FEATURES: Your choice of either UniFLEX or OS-9 LEVEL TWO. Both are Unix-like Multi-User/Multi-Tasking Operating Systems.

56KB FLEX/OS-9 "SWITCHING" SYSTEM $4148.49

HARDWARE FEATURES:

- ★ 2MHz 6809 CPU
- ★ 56K Static Ram
- ★ 2 RS232C Serial Ports
- ★ DMA Double Density Floppy Disk Controller
- ★ 2 Built-in 5¼" 40tr DSDD Disk Drives (80 Track DSDD Drive Option . . add $400.00)

SOFTWARE FEATURES:

- ★ GMXBUG monitor — FLEX Disk Operating System
- ★ OS-9 LEVEL ONE Multi-tasking operating system for up to 56K of memory

WINCHESTER SUBSYSTEMS

Winchester packages are available for upgrading current **GIMIX** 6809 systems equipped with DMA controllers, at least one floppy disk drive, and running FLEX, OS-9 LEVEL ONE or OS-9 LEVEL TWO. The packages include one or two 19MB (unformatted) Winchester drives, DMA Hard Disk Interface, and the appropriate software drivers. The Interface can handle two 5¼" Winchester Drives, providing Automatic Data Error Detection and Correction: up to 22 bit burst error detection and 11 bit burst error correction.

Dual drives can be used together to provide over 30 MBytes of on line storage -- or use one for back-up of the other. (More convenient and reliable than tape backup systems.

#90 includes one 19MB Drive, Interface, and Software **$4288.90**
#91 includes two 19MB Drives, Interface, and Software **$6688.91**

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Circle 22 on Reader Service card.

The Voice Box offers low-cost, programmable speech synthesis for Atari and Apple computers.

to load a disk; however, custom dictionaries can still be put on disk. This model has the capability to sing songs in any key. The AL-3001 is priced at $215.

The Alien Group, 27 West 23rd St., New York, NY 10010. Reader Service number 472.

JRAM Memory Expansion Board

The JRAM Memory Expansion Board is an IBM PC compatible memory board that allows you to break through the IBM 640K memory barrier. JRAM comes with 512K bytes.

With the JRAM board, Tall Tree Systems offers software to control a hardware pager. The software, JEL and JFORMAT, creates an electronic disk which uses all RAM over 64K bytes to emulate a floppy disk.

With JRAM in floppy emulation mode, all related files can be loaded into RAM and no time-consuming disk access is necessary. The size of this electronic disk can be up to 16 megabytes. Memory is relocated on any 64K segment boundary and can also be assigned to PC DOS.

JRAM sells for $1200; JEL and JFORMAT are available separately. Tall Tree Systems, 1036 Los Altos Ave., Los Altos, CA 94022. Reader Service number 470.

The Brother HR-1

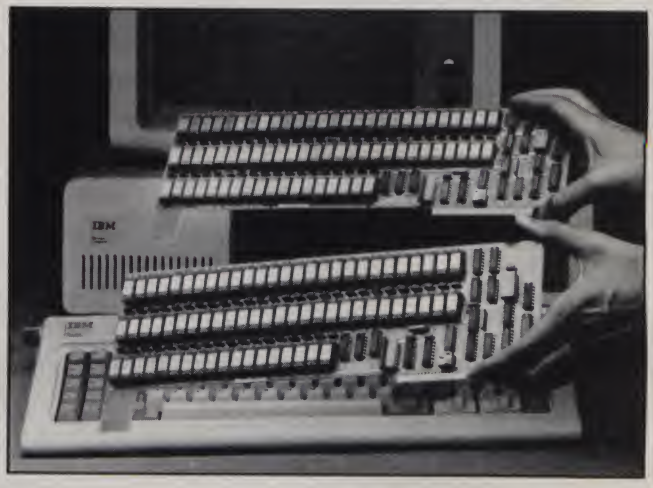
The Brother HR-1 daisy wheel printer, designed especially for word processing applications, offers the performance and features not found in other printers. The Brother HR-1 has one-touch interchangeable cassette-type daisy wheel and ribbon for ease of operation. A tractor option, which enables conversion to fanfold in seconds, and a dual warning system of sight and sound to signal "paper out" and "ribbon end" are also offered.

The Brother HR-1 can handle memos, forms and reports. With bidirectional printing, the HR-1 can handle paper up to 16½ inches wide, and it interfaces with QUME Sprint 3, RS-232C and Centronics parallel.

The cost of the printer ranges from $1150 to $1250. Dynax, a division of Kanematsu-Gosho Inc., 333 So. Hope St., Suite 2800, Los Angeles, CA 90071. Reader Service number 469.

The Critical Connection

The Critical Connection



The 512K JRAM Memory Expansion Board from Tall Tree Systems.

The Brother HR-1 daisy wheel printer from Dynax.

(also known as the CP/M-Atari Connection) makes it possible for either an Atari 400 or 800 to connect to a CP/M system; this allows Atari owners to use the CP/M system's printer, disk drives and keyboard.

The Critical Connection consists of all the hardware necessary to connect an RS-232 serial port on a CP/M system to an Atari disk/printer port up to 50 feet away. The Critical Connection has an eight-inch single-density disk with the software necessary to make the CP/M disk drives, printer and keyboard replace their regular Atari counterparts.

To use the Critical Connection, you must have a complete CP/M system and either the Atari 400 or 800. The Critical Connection costs $175 and is available from USS Enterprises, 6708 Landerwood, San Jose, CA 95120. Reader Service number 467.

Portable Color/Graphics Computer System

The Portable Color/Graphics Computer System is designed for Personal Computer users who need the system mobility and accessibility of a self-contained PC system with optional Color/Graphics CRT display for remote interactive computing in business or field use.

The Portable Color/Graphics Computer maintains IBM systems compatibility with the standard Personal Computer and utilizes current IBM software, including DOS or CP/M 80/86 operating systems, Basic, Fortran, Pascal or Cobol compilers and IBM graphics applications programs.

The unit comes in a high-durability portable carrying case or stylized desktop enclosure. The prices range from $3,088. Computer Systems, 26401 Harper Ave., St. Clair Shores, MI 48081. Reader Service number 468.

I Talk II

The I Talk II is a speech synthesizer designed specifically for the Atari 400/800.

The synthesizer comes complete and ready to plug in. It has four voice frequencies and an unlimited vocabulary. The I Talk II will speak while action graphics and sound effects are being executed. The unit comes with a free spelling game called Wordblaster. This arcade-style educational game can be programmed to challenge all age groups.

The I Talk II will operate with disk, cassette and other accessories while connected. The unit comes with complete phonetic speech dictionary to help you make almost any word or sound.

For a limited time the I Talk II costs $199. Greenbrier Marketing International Inc., 8225 East Rovey, Scottsdale,

The Portable Color/Graphics Computer, from Computer Systems, provides mobility for IBM PC users.

AZ 85253. Reader Service number 466.

WIN 5-IBM

Computer Dynamics has announced WIN 5-IBM, a high-reliability, high-performance, five-megabyte hard disk subsystem for the IBM PC.

The WIN 5-IBM is a complete subsystem ready to operate with the IBM PC under MS-DOS. The unit features an environmentally sealed Winchester drive with error detection and correction and a 4.8 megabyte data transfer rate.

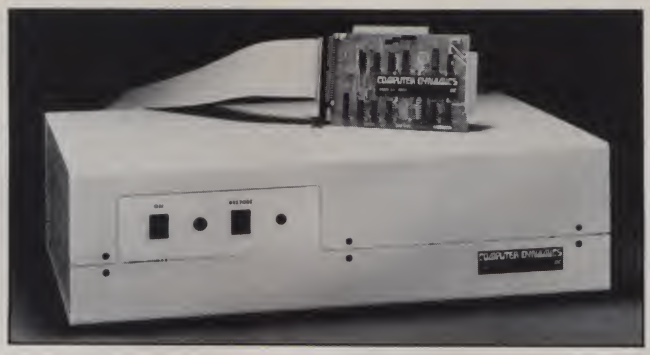
The WIN 5-IBM is external to the IBM PC, eliminating any heat buildup problems that have been experienced with internally mounted units. The WIN 5-IBM costs $1695. Computer Dynamics, Inc., 105 South Main St., Greer, SC 29651. Reader Service number 462.

SP-2000 80 Column Printer

The SP-2000 is an 80-column, rack mountable printer from Syntest Corporation. Microprocessor control and EPROM program memory allows for special functions such as multiple-size printing, tabs, and multiple line feeds.

The printer features 100-characters-per-second speed, 1000-character buffer; custom software for special applications; 5 × 7 dot matrix impact printing; 64-character ASCII subset; and removable front panel for easy paper and ribbon replacement.

The SP-2000 80-column printer costs $925. Syntest, 169 Millham St., Marlboro, MA 01752. Reader Service number 464.



The WIN 5-IBM is a five-megabyte hard disk subsystem for the IBM PC. The product is manufactured by Computer Dynamics, Inc.

Four Add-Ons for Sinclair

Memotech Corporation has announced four add-ons for the Timex-Sinclair 1000 and ZX81 computers: a 32K RAM Pak, a high-resolution graphics pak, a Centronics parallel printer interface and an RS232 interface.

The 32K RAM Memopak provides a full 32K of directly addressable RAM to Sinclair computers. It lets Sinclair owners execute sophisticated programs and store databases. It is also compatible with Sinclair's or Memotech's 16K RAM to give a full 48K of RAM.

The Memopak High Resolution Graphics contains a 2K EPROM monitor, holding a full range of graphics subroutines which can be called up either by Basic USR function or by machine code. It provides fully programmable high-resolution capabilities (192 × 248 pixels).

The Memopak Centronics Parallel Printer Interface enables Sinclair computers to be used with a wide range of dot matrix and daisy wheel printers (printers which accept Centronic parallel input). It is fully compatible with Sinclair Basic. The printer is activated by the Basic commands LList, LPrint and Copy. The interface allows for full 80-column capability. Lowercase characters can be printed by using the inverse character set.

The Memopak RS232 Printer Interface lets Sinclair computers communicate along standard industry lines with other computers and peripherals, including modems. The interface enables Sinclair computers to be used with a wide range of dot matrix and daisy wheel printers which accept serial RS232 input.

The 32K RAM Memopak is priced at $109.95, the High Resolution Graphics Memopak at $144.95 and the Centronics and RS232 Paks at $104.95 and $139.95, respectively. Memotech Corporation, Customer Services, 7550 West Yale Ave., Denver, CO 80227. Reader Service number 461.

Color Chart

Color Chart is a color video RAM board designed for Commodore systems. The 2½ × 5-inch board plugs into a 2532 ROM socket. Two control wires clip to read/write signals in the system and convert the ROM socket into a 4K video RAM.

Color Chart can be operated in eight different modes ranging from an alphanumeric 32 × 16 display with built-in character generator to a high-resolution graphics mode with 128 × 192 pixels; up to eight different colors are available depending on the mode.

Color Chart can be used to present independent color graphics displays on a PET/CBM while the main screen displays corresponding text; business graphs and game graphics can be displayed.

Color Chart sells for $139.95. CGRS Microtech, PO Box 102, Langhorne, PA 19047. Reader Service number 463.

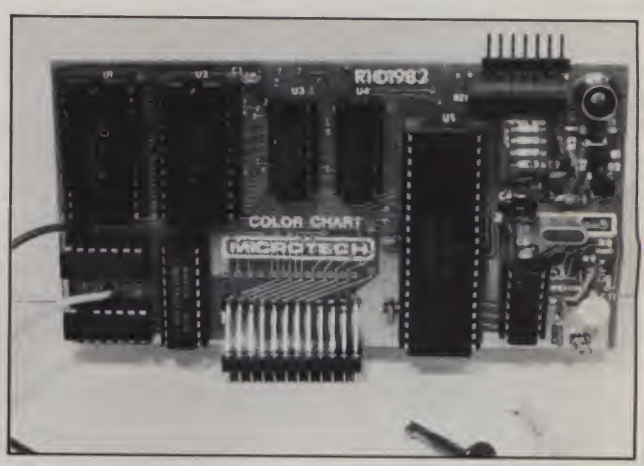
The Sourcebook

Information Sources, Inc., has published a guide for computer owners called Small Systems Software and Services Sourcebook.

The Sourcebook is a result of a two-year study and describes in detail and in nontechnical terms the applications and limitations of hundreds of programs.

The Sourcebook is over 500 pages long and is designed to help you avoid buying software programs that don't fill

The SP-2000 dot matrix 80-column printer from Syntest Corporation features 100 cps and a price tag under $1000.



Color Chart, from CGRS Microtech, is a color video RAM board for the Commodore PET.

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The Sourcebook is available at a one-year subscription rate of $125. Information Sources, Inc., 1807 Glenview Road, Glenview, IL 60025. Reader Service number 460.

Network Inquirer

The Business Computer Network Corporation has introduced a handheld computer called the Network Inquirer. The small computer enables users to access hundreds of public databases merely by selecting the network desired from a menu and depressing the appropriate selection number. At this point, the Network Inquirer dials the requested network and logs on and off or redials the network automatically. No programming or network experience is required.

Another feature provided by the Network Inquirer is electronic mail. This system lets you send correspondence to other users "on-line." The information can also be received by the Inquirer automatically in its own electronic mailbox for retrieval at a later time.

The Network Inquirer costs less than $100 and includes manuals and runbooks. The Business Computer Network, 211 South 4th St., Basin, WY 82410. Reader Service number 465.

VersaWriter

VersaWriter is a Digitizer Drawing System for the IBM Personal Computer. The VersaWriter Drawing Tablet plugs directly into the IBM PC Game Control Adapter's connector and allows immediate entry of graphics to the IBM PC's 320×200 and 640×200 screens. No expansion slot space is required; software is provided.

Over 30 graphics commands and more than 100 color options are available. Graphics produced with the VersaWriter can be saved on disk and printed as hardcopy on an MX 80 printer.

The IBM VersaWriter is available for $299. Versa Computing, Inc., 3541 Old Conejo Road, Suite 104, Newbury Park, CA 91320. Reader Service number 496.

MICRO QUIZ

(from page 137)

Answer: 7

S	A
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2	1210
3	1331
4	1464.1
5	1610.51
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7	1948.72
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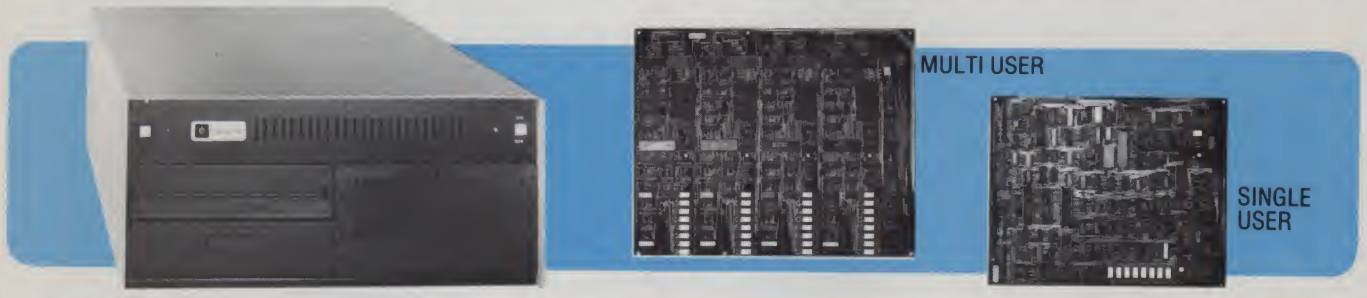

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(from page 162)

memory commands, actual changes in memory data are not possible in Raid's primary command mode. To actually alter data, we use the open mode.

One of the most powerful aids in the open mode is the Indirect Open. Simply put, Indirect Open will access the memory location pointed to by the current opened location. Most effective in the instruction format, Indirect Open allows the actual program flow to be viewed. Not only can you move through a program following the execution path, you can return by the same route you came! A Dot Stack maintains the return addresses where indirect opens were executed.

This feature allows for very efficient viewing of program flow. No backtracking is available in this mode, but you can move down through the actual flow of a program at incredible speed.

The ease of open mode operations cannot be overemphasized. These are simple, single-key entries that let the programmer move through the program at will. With its dump-forward and dump-backward commands, I compare this operation to viewing the source code on a micro-film reader, with the added advantage of absolute, positive positioning and the ability to change the code as you go.

Flag Commands

In the emulator mode, ten emulator flags control everything. These commands are entered in the primary mode. Flag commands are usually two-letter commands followed by one or more arguments. Generally, the first letter of every command is either S for set the flag or C for clear the flag. Additionally, certain flags can be verified when the first letter of the command is V and arguments previously named can be removed with the letter R.

There are, in my opinion, a few areas where Raid could be polished. However, these are areas where individual programmers will almost never find common ground. We all do things a little bit differently.

As far as I was able to discover, there are no bugs in Raid. Everything functioned as the manual indicated. What follows are convenience features that I believe would make Raid more useful.

When memory is protected, up to five zones can be defined. When verifying the protected areas each zone, one through five, will display the upper and lower limits of the protected RAM. Zone 0 always protects Raid through the end of RAM (FFFF hex). This means that calls to CP/M that bypass the BDOS at address 05 and jump directly to BIOS are not allowed when the emulator is active. I can understand why Raid might be protected, but the rest of the system should be left open to the programmer.

Anyone effectively using this program will be aware of the problems of poking holes in the CP/M operating system.

The input command processor should scan off blanks to make input clearer for those who want to separate arguments with spaces. As it is now, blanks are considered part of the command or argument, returning error messages when blanks are embedded in a command or argument.

The documentation is clear and easy to comprehend. Examples are included in all but the most basic command instructions. Improvement could be made in the manual layout; I found myself flipping back and forth between areas that should be on the same or adjacent pages.

The reference card supplied with the user's manual provides a guide to the most used features of Raid. I use the card whenever I use Raid, although I do not refer as often as I become more familiar with it. A few of the program's commands do not appear on the Quick Reference Card.

The price of Raid might put it out of the range of many serious programmers. However, I have seen tools costing as much or more than Raid that didn't do nearly the job that it does. I consider Raid a bargain and recommend it to all serious assembly-language programmers. *(Southern Computer Systems, PO Box 3373A, Birmingham, AL 35255. $250; $395 with Floating-Point Option.)*

Gene Head
Corvallis, OR

DLMS

This software will
Make IBM material
Out of you

Owning an IBM Personal Computer carries with it certain responsibilities. After all, when you purchase an IBM PC you're not only buying a computer, but a machine that carries with it the entire history of electronic data processing.

I must admit, I do not live up to such obligations easily. Sitting in front of my keyboard, looking at that famous IBM logo, I often feel like something of a faker. I'm just not the IBM type. An IBM user should be neat, polite and, above all, highly organized. Unfortunately, I'm none of these—especially organized.

Fortunately, there are software manufacturers out there who recognize this problem; there are concerned companies that realize it takes more than just the appropriate amount of cash to turn an ordinary computerist into IBM material. Software Architects Incorporated is such a company. Their Diskette Library Management System is the sort of program that can take the most unorganized IBM PC user and turn him into the pride of Armonk, New York (IBM's HQ).

DLMS to the Rescue

DLMS is a program for your programs; it's a tool used to organize your collection of disks. Such software has long been available for other popular micros, but this is one of the first geared to the IBM PC user. Fortunately, in every respect, DLMS is a winner.

DLMS runs on any dual-disk-equipped IBM PC with a minimum of 64K RAM. I found the package simple to use. In a nutshell, the system consists of a series of interactive programs that enables the operator to add, maintain, delete, inquire, organize and (with a printer) provide hard copy information about every disk, disk file and file extension in the user's library. Specifically, DLMS will store the following information.

- Disk number
- File name
- Record length
- Initials of each file's creator
- Creation date
- Date to be deleted
- System associated with the file
- Operator's comments

Using DLMS

Depending on the size of your disk library, entering the required data into DLMS can take anywhere from a couple of minutes to a couple of days. For the average 30-words-per-minute typist, a collection of about 200 disks will take about eight hours to place into the system. Fortunately, once a library has been entered, updates can be added very quickly and the program's editor feature will immediately alert you to correct any *incorrect* data entries as you proceed.

One of the advantages DLMS holds over listing disks and files in a notebook, is its ability to recall information in a variety of ways. For instance, say you're looking for a particular word processing program, but can't remember which disk it's stored on. With DLMS, all you have to do is type the program's name, wait about a minute while the system searches for a match, then view the program information on your display. DLMS also allows the user to scan through files in sequential order (just in case you've managed to forget the file name or wish to show your complete collection to a guest).

My favorite DLMS application is one that's not played-up in the documentation, but can be very handy in any case: the system's ability to help the user cram the most data on each disk. By printing-out a list of the files and file extensions stored on each disk, along with their lengths and total length, it becomes easy to juggle around the various files to obtain the greatest amount of storage on each disk. If one has a fairly large program collection, it should be possible to recoup a DLMS outlay just on the money saved by not buying new disks.

Documentation

A program that organizes software should have well organized documenta-

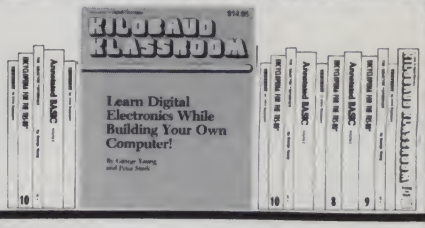
WAYNE GREEN BOOKS

KILOBAUD KLASSROOM

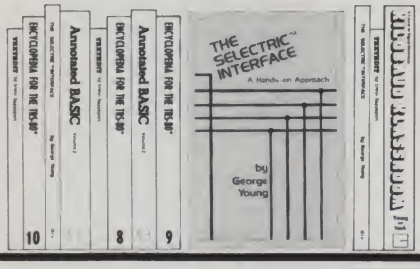
by George Young and Peter Stark

Makes learning electronics fun and easy. First published as a series in *Kilobaud Microcomputing*, the book combines the learning of essential theory with practical, hands-on experience. The course begins with basic electronic projects and culminates in the construction of your own programmable microcomputer. The direct instructional methods of authors Young & Stark make KILOBAUD KLASSROOM a simple way for you to acquire a solid background in digital electronics.

BK7386 (419 pages).....$14.95



THE SELECTRIC INTERFACE by George Young



You need the quality print that a daisy wheel printer provides but the thought of buying one makes your wallet wilt. The SELECTRIC™ INTERFACE, a step-by-step guide to interfacing an IBM Selectric I/O Writer to your microcomputer, will give you that quality at a fraction of the price. George Young, co-author of *Kilobaud Microcomputing* magazine's popular "Kilobaud Klassroom" series, offers a low-cost alternative to buying a daisy wheel printer. The SELECTRIC INTERFACE includes: step-by-step instructions, tips on purchasing a used Selectric, information on various Selectric models, including the 2740, 2980, and Dura 1041, driver software for Z80, 8080, and 6502 chips, tips on interfacing techniques. With The SELECTRIC INTERFACE and some background in electronics, you can have a high-quality, low-cost, letter-quality printer. Petals not included.

BK7388 (125 pages).....$12.97

TEXTEDIT

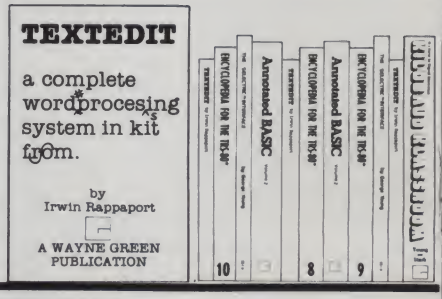
A Complete Word Processing System in Kit Form

by Irwin Rappaport

TEXTEDIT is an inexpensive word processor that can be adapted to suit your differing needs—from form letters to lengthy texts. Written in TRS-80 Disk BASIC, the system consists of several modules, permitting the loading and use of only those portions needed. A disk is also available which provides the direct loading of the modules, however, the book is required for documentation. For Model I and III with TRSDOS CONVERT., one disk drive (2 disk drives or copy utility needed to transfer to system disk). Runs under TRSDOS 2.2/2.3. May not function under other systems.

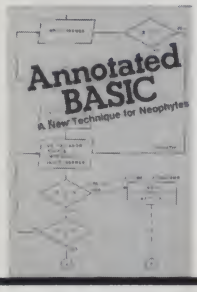
BK7387 (book, 90 pages).....$9.97
DS7387 (disk).....$19.97

Disk is manufactured by Instant Software, a division of Wayne Green Inc.



ANNOTATED BASIC

A New Technique for Neophytes



Put your BASIC knowledge to work for you with this 2-volume set of TRS-80 Level II BASIC programs. Gain a better understanding of the elements and techniques involved in programming. ANNOTATED BASIC'S uniquely designed format breaks each program down for you to include: initial documentation and instruction, definitions of New BASIC Concepts, flowchart, annotations of sections, showing how each part fits into the whole, and explaining why certain BASIC commands are chosen over similar ones.

Using the programs as they are or modifying them to sharpen your programming skills, ANNOTATED BASIC is a helpful tool for any BASIC programmer.

BK7384 (Vol. 1, 152 pages).....$10.95
BK7385 (Vol. 2, 136 pages).....$10.95

COMPUTER CARNIVAL by Richard Ramella

Your child can become a crackerjack computerist with the sixty TRS-80 Level II programs in COMPUTER CARNIVAL. This large-type, spiral bound book for beginners is a veritable funhouse of games, graphics, quizzes and puzzles. Written by *80 Micro* columnist Richard Ramella, the programs are challenging enough to ensure continued learning, yet short enough to provide your child with the immediate delight and reward of mastering basic computing skills. And for even greater enjoyment, get the CARNIVAL COMPANION, a 30-minute cassette containing all the programs in the book. Eliminates tiresome typing and lets your child spend more time enjoying the programs.

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tion. In this respect, the DLMS documentation doesn't disappoint. Packaged in an attractive vinyl binder, the 45-page instruction package is clearly written and takes a straightforward, nontechnical approach to the system's operation. Numerous illustrations picturing the display in different program settings are sprinkled throughout and practical advice can be found on every page. After ploughing my way through dozens of documentation booklets that not only fail to inform but actually end up misleading the reader, the DLMS package struck me like a cool breeze on a hot day.

Conclusion

If used diligently, DLMS can be very helpful in organizing even the sloppiest computerist's disk collection. After using my copy for about two weeks, I noticed a remarkable change taking place in my system. Files that once took me up to an hour to find can now be accessed within a matter of minutes. Outdated programs have been deleted and treasured instruction sets now have documented backups. But the most significant improvement may actually be the most readily apparent. Since all of my programs are now arranged in a coherent order, I no longer have a problem with floppies flying about my desk—or falling on the floor.

I may not be there yet, but I think I'm rapidly becoming IBM material. *(Software Architects Incorporated, 27B Griffith Lane, Ridgefield, CT 06877. $100.)*

John Edwards
Glendale, NY

Nevada PILOT

This language, for CP/M Systems, makes writing Educational programs easier

"If we had a home computer, Junior could use it for his school work. I'm sure it would improve his grades."

OK, so you conned your wife into letting you buy that new computer. Now you have to make good on your rationalization, but where's all that professional educational software you need? Unfortunately, there are very few learning programs available.

Those that you did buy only served to whet your child's appetite. So, you tried writing your own programs in Basic but soon you found you weren't up to this task. Basic simply takes too long. Don't feel bad. Even experienced programmers have trouble developing teaching programs.

Basic doesn't readily adapt itself to user-friendly screen displays and interactions. To make things worse, you will have to write a lot of little programs to reach your goal. Sound hopeless?

Fortunately, there is a solution—PILOT (Programmed Inquiry, Learning Or Teaching). This language was specifically created to make writing learning programs easy for nonprogrammers. However, why shouldn't the rest of us use it? Everything that PILOT does, Basic can do—but with more effort for you, the programmer.

Basic is an all-purpose language. On the other hand, PILOT is specialized. There are many things that it cannot do. You'll never write an accounting program with it since it uses only integer arithmetic. You'll never write an inventory program since file handling is rudimentary. You can, however, write a lot of quick, specific interactive programs.

I have been using an early cassette-based PILOT; however, I have graduated to a CP/M disk-operating system, so in order to use PILOT, I had to leave the system, enter the program on cassette recorder and later save my program on tape. Anytime I wanted to run a program, I had to repeat this process.

My six-year old son, who can run my disk drives, couldn't do all that was necessary with a cassette recorder. If my programs were to help him, I needed a new system.

PILOT was specifically created to make writing learning programs easy for nonprogrammers

Fortunately, Ellis Computing came to my rescue. They market an updated, disk-based version called Nevada PILOT. In fact, J. Starkweather, creator of PILOT, rewrote the program. It requires a CP/M system with 32K of memory and a single disk drive. It seems to be available on every disk format supported by CP/M. I immediately ordered the Micropolis version.

Ellis Computing advertises that its version meets all ANSI standards for PILOT. That's like saying a Mercedes meets all standards for being a car. Certainly, standard PILOT commands like type, accept, match, compute and jump are there—so are an amazing number of screen controls.

You can manipulate your cursor, use inverse video and stop your display until you are ready to move to the next step.

Two weeks after I ordered it, my Micropolis disk arrived. My distribution disk contained an unconfigured version of PILOT, three test programs and eight demonstration programs. Also included were a 146-page programmer's reference manual in a binder, the usual licensing agreement, a form for user problems and a self-addressed return envelope. The entire kit exuded professionalism.

The documentation for PILOT is exceptional. This means that it has been repeatedly edited and corrected. Naturally, there are many pages about newer commands. Each command is explained in about a page of definitions, examples and exceptions. Although the manual is not promoted as a textbook of PILOT, it is. Five pages are devoted solely to the editor function.

There are three PILOT programs at the end. These aren't just five or ten lines long; they take 23-pages of source code, all of which are included. All resources of PILOT—commands, disk file handling and even error messages—are demonstrated. By running these examples and analyzing them, you should have no trouble writing your own extensive programs within hours. You'll even become skilled at stealing some of the subroutines!

I approached configuring my terminal with trepidation. I have a five-year old SOL-20 and I had just finished wasting several evenings unsuccessfully trying to configure Lifeboat Associates T/MAKER. Last thing I needed was another fiasco.

To my surprise, the program PILOT4.COM executed immediately and led me by the hand through a configuration process. Amazingly, buried in 15 standard terminals was SOL. There was even a subroutine for an IMSAI!

Even if your terminal isn't listed, initialization merely means entering the number of lines on your display, the number of characters per line and the starting address for a memory-mapped display.

The thing that struck me when I started experimenting with PILOT was that all my keyboard keys worked as they should. Delete actually deleted a character and moved back to let you type a new letter over the deleted one. There was no nonsense of echoing deleted characters! Repeat did just that, the four arrow keys actually moved the cursor and the home-cursor key worked. Only a user of CP/M can appreciate these features.

Since PILOT is meant as an aid to teachers, it has to interact with students. Unfortunately, most pupils are not programmers and don't give simple yes or no answers. Too often their replies are, yep, yeh, nope, naw or worse. PILOT's match and inmax commands minimize such problems.

The match command automatically parses input, searching for any correct answer. A well thought-out Basic program will do this too, but an unsophisticated user doesn't have the time or the experience to write such a subroutine.

A major feature which prompted me to buy this program was that it is disk oriented. To me, this meant that I could save and load programs on disk faster than I could on cassette tape. This was all I wanted. Boy, did I get that and more!

Your programs can access disk files

like any program written in an extended disk Basic. This allows teachers to leave their students to progress at individual rates, but still keeps a file on each student with a record of errors and successes. Once again, the manual gives specific examples of this.

The editor in this package is superb. It's screen-oriented; this means that what you see on screen is what you get. If, as you are writing, you notice an error seven lines back, merely move the cursor back there and correct your mistake.

There's no nonsense of setting the cursor, counting characters and giving elaborate control codes. If your keyboard has vertical and horizontal arrows, use them for cursor movement. Many editors just ignore these useful keys. If you have not already replaced the editor that comes with CP/M, PILOT's editor will fill the bill.

There are, unfortunately, a few bad points about the editor. First, there's no command to move the cursor to the end of a file or to continuously scroll through it. The closest command is control-R. This will scroll down a half screen at a time.

Second, control codes for text editing are somewhat irrational. Why use control-G instead of control-D to delete a character? Why use control-T instead of control-I to insert one? Finally, after you press control-F to exit editor function, nothing happens on screen for a full five seconds. This may not seem like much, but five seconds wondering whether or not you did the right thing seems like an eternity.

Nevada PILOT has seven error messages. Each is a complete statement, not a two-letter or four-digit code. You don't have to refer to your manual to figure out where your program went wrong. However, for those of us unable to see the obvious, there is an error-code summary that contains suggestions to where we went wrong and how to correct it. This is yet another easy-to-use feature of the program.

A novel feature of PILOT is its ability to control a video cassette recorder (VCR). I don't own one of these gadgets, so I don't know from experience how well this function works. Specific instructions are given for constructing a custom connecting cord. All pin connectors are defined for Sony's model SLO-320, SLO-323 and VP-2011 VCR's. I don't believe you will have problems connecting any other brand. Computer control of a VCR in connection with an educational program is an exciting new concept.

Summary

Ellis Computing's version of John Starkweather's PILOT, is well-thought out, well-documented and well-supported. Just as word processing programs have taken personal computers beyond games, PILOT will add new dimensions to your home computer. *(Ellis Computing—Software Technology, 600-41st Ave., San Francisco, CA 94121. $149.)*

Bruce R. Evans
Pickering, Ontario

Sports Management Series

If you're into sports Management, these Programs are for you

If you are interested in sports management (i.e., recreational facilities reservations, league scheduling, registrations or standings, swimming or tennis meet management), you will no doubt be interested in these programs for the Apple II computer.

Market Computing has programs specifically tailored for use as management tools and organizers for each of these applications. These programs are special because of the consistency maintained in all areas of the product: documentation, operation and computer hardware requirements.

The manuals provided with each program are of consistently high quality. A window in the front cover shows the name of the program on the title page. A table of contents is followed by an introduction that functionally diagrams the individual program. Chapter 1, Getting Started, provides a three-step procedure common to the entire family: write protect the master disk, make working copies of it, then boot from a working copy.

The central body of each manual describes in detail the operations that can be performed by each item in these menu-driven programs. An interesting feature is that an example of each screen is provided to aid in the description and to help describe operations at hand.

The last chapters in the manuals include step-by-step procedures to be used for copying the master disks, an occasional appendix or options listing and a few blank pages for you to make notes.

The manuals are clear and concisely written. Computer words like database manager do not appear (all of these programs fall under this category). I would rate these manuals as good to excellent, especially considering that computer jockies can use them without choking; first-time users, if they take the time to read them, have a very good chance of bringing up the system without a hitch.

Operation and program design has been carefully engineered for consistency throughout. All programs are totally self prompting, and the manuals will normally not be required. The screen driven menus are explicit and effective.

Data entry is also carefully handled. When an input is required, a series of dashes (representing the maximum input length) is typed over as the entry is made. Numbers, such as dollars and cents, are entered calculator style. That is, the first numbers entered are moved to the left as more are entered. Unless entered, the decimal point is assumed at the right of the last number typed, and the system automatically assumes zero cents unless told otherwise.

Hardware requirements for these programs are an Apple II, 48K of memory, two disk drives in slot 6 and an 80-column printer in slot 1. (The printer is really optional for data entry and editing, but all programs have the ability to print summaries, labels, etc., so it becomes a necessity.)

The following briefly summarizes my impressions of each of the programs. As you will see, each program was designed to perform a specific function. I did a random spot check and was amazed to find that generally 600 to over 900 lines of Basic code were used in each program.

Leagues

Three programs are available for use with various leagues. League Registration allows up to 1100 individual players to be registered. League Scheduling automates the printing and maintenance of schedules for round-robin league play. (Team schedules, league schedules and mailing labels are all automatically available.) League Standings keeps track of team standings. All the usual score

records are kept, including points given up, game standings and report generation; coach mailing labels are also available.

League Registration

The registration program is the master database manager for the league programs. It allows the entry of all participants of a league into particular teams. It can generate reports consisting of team rosters, the league roster, age of players, fee reports, resident report (analysis by number of players in various categories, i.e., male-females, resident-nonresident) and labels for players' mailing lists.

All data entry is performed by this program with complete editing facilities for adding, deleting or changing player information. The date and time of a report can also be added to the report heading, allowing you to make sure the reports in use are current.

The manual for League Registration is detailed and contains many examples (generally one for each operation) and will get the computerization of your league started on the right foot.

League Scheduling

Probably one of the more difficult aspects involving league play is scheduling. When and where does each team play? Have all had an equal number of games at home and away? When all that is settled, schedules have to be typed and mailed to each player.

League Scheduling can automate the entire operation. You give it the number of teams, dates or days of the week the league plays and the number of time periods used each day. It equally distributes home and visitor games, prints league schedules, team schedules and prepares mailing labels for everyone. As a matter of convenience, all reports can be displayed on the screen before printing. This allows manual changes if required.

League Standings

Once your teams have been registered and scheduled, the results of their play must be recorded and standings generated. This program allows you to enter game results, edit team standings and generate several reports based on these statistics. (The editing of standings allows you to correct errors in team scores already entered.)

Reports consist of team rosters, team standings and mailing labels for the coaches of each team. Reports can be generated any time and need not be done at the time of an update.

The league programs, on a whole, appear to be complete. The only possible exception I could think of was that no individual or team handicapping or scoring is possible, an issue that could adversely affect some sports. Individual scoring in bowling teams, for example, is often important.

Accounting for membership fees and insurance, a flexible scheduling mechanism, and a common database indicate that these programs are well designed. The manuals are certainly complete as far as program operation is concerned. You should not have any problems using them if you have gotten to the point where you can reliably turn on your Apple.

Reservations

Two reservation programs are available from Market Computing: Short-Term Reservations and Long-Term Reservations. With the short-term program you can store information on up to 16 facilities for periods up to two weeks; as many as 12 separate time periods for each day can be used on each facility. The long-term reservation allows up to 50 facilities to be reserved for up to 900 days. In each case, the limitations are based on disk space; additional disks may be used as required.

> These programs . . . (contain) a good deal of sophisticated design and they reek of quality

The controlling programs function nearly identically for each of these programs; the programs are self prompting and need little operator attention except to enter data and answer questions from the menu or other parts of the program. Provisions for easily adding, changing and deleting reservations are all menu based and are easily done by people with no computer background.

As with the league programs, these appear to be high-quality, complete programs. Reports on organizations reserving the facilities as well as reservation and fee reports are available at literally the touch of a button.

The remaining two programs are Swim Meet and Tennis Draw. Both of these are specifically intended to be used in those sporting events, but still retain all the simple operating features and procedures described in the other Market Computing programs.

Tennis Draw and Swim Meet

Tennis draw automates player registration (eight to 64 players or teams) and automatically makes a drawsheet for single-elimination, random-draw tournaments. Up to 21 events can be scheduled.

Swim Meet is meant to be used in competitive swim meets. Swimmer registration, heat listing, event listing and final results are automatically handled, again with no computer sophistication on the part of user required.

Personal Opinions

These programs exhibit an apparent excellent attention to detail, but rather than say that they are the answer the world has been waiting for, I have to qualify my enthusiasm. I am not a tennis tournament director or a swimming coach, and I don't participate in league bowling or reserve facilities for campers or sportsmen. More importantly, I could not take the time to simulate any of these proceedings. That comes under the category of software testing.

What I can tell you about these programs is that there is a good deal of sophisticated design in them and that they reek of quality. Market Computing publishes names and phone numbers for those who need assistance—right up front in two places—on the first and second pages.

The manuals are almost squeaky clean. They have been written in a thorough and professional manner. Indeed, that is probably my only complaint about them. The writers have managed to remove all jargon and technical terms not absolutely necessary, and have created an excellent manual that is easily understood, but still a little remote from the user. Not quite friendly, and just slightly reserved—a concept that is hard to explain. I think that if you or any of your friends have a need for specialized programs of this variety, you should certainly consider these.

My only cautions to those who want to consider automating your league activities are 1) Computers generally do not save time or money. They do increase productivity and (in many cases) accuracy. 2) Initial data entry, that is, getting all the names and teams recorded into the computer, will be a very big pain in the side—or elsewhere—and must be done with absolute accuracy if your computerization is not to be a nightmare, and finally 3) Using computers allows you to make very big mistakes. You can throw away a great deal of effort with a keystroke or two.

One last word about these programs. These are database managers and, as such, once installed and operated for a short period of time will become a way of life and thinking to those that use them. It would be appropriate to carefully consider the consequences of total loss of either the Apple's operability or a power glitch that destroys your data disks; emergency backup procedures should be planned out well in advance, because sometime, somewhere, when you least expect it...smile...your system's got you!

(Market Computing, 201 15th Ave. S.W., Puyallup, WA 98371. League Registration, $150; League Standings, League Scheduling, Short-term Reservations and Long-term Reservations, $100 each; Tennis Draw, $60; and Swim Meet, $125.)

Jim Hansen
New Boston, NH

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Raid–CP/M Debug Tool
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Raid

A CP/M debug
Program for assembly
Language programmers

Sophisticated assembly-language development tools have made the job of assembly-language programming enjoyable and rewarding. Raid is such a tool.

Raid is a comprehensive debug program with a floating-point option designed to run with the CP/M operating system. Raid is complex, but easily learned and just as easily used.

First, the floating-point option is actually two development tools. You'll appreciate it if you work with real numbers that require more than integer precision. Raid will both respond to display floating-point numbers and provide the source file of a complete floating-point system. With this source file, precision arithmetic is simply a matter of loading memory locations with floating-point values and calling the appropriate subroutine.

The most powerful design feature of Raid is its ability to run as either a real-time monitor and debugger or an emulator. In the emulator mode you can avoid crashing because the system CPU never actually executes the instructions of the program under test. Rather, Raid will fetch the proper instruction and simulate execution of the instruction. Thus you have the advantage of knowing what is about to happen before it actually does.

You can set program limits on both the program counter and the stack pointer while in the emulator mode. Whenever either of these registers is about to have a value in it that is outside the range you previously set, the program initiates its own break and halts execution.

You can turn the emulator on and off on command and define real-time subroutines that allow the emulator to control the uncertain portions of the program; the subroutines also allow the system CPU to execute code known to be functional, such as system calls and previously debugged sections of code. As subroutines are debugged, they can be added to the list of real-time subroutines. This process can continue until all units of a program are bug-free.

Getting Started

Before Raid is run, to debug the target or test program, a special program called SMBMAK is run to create a symbol file used by Raid. SMBMAK uses the .PRN or .SYM file generated during assembly to create a symbol file usable by Raid. This file, called filename .SMB, is *not* an ASCII file and cannot be listed. It is strictly used by Raid to let you interact with Raid, using the same symbols and labels used in the source program.

Commands are one or two letters, followed by a semicolon if the command requires one or more arguments. Arguments are likewise separated by a semicolon. Arguments can be a symbolic, numeric or evaluated expression. For example, one method of beginning execution through Raid is the go command (G). This command requires exactly one argument, the address where execution is to begin. The three valid argument expressions are:

G:100 (C/R)	Numeric
G:START (C/R)	Symbolic
G:START + 3 (C/R)	Evaluated Expression

When typing commands, you use the CP/M console command processor to allow normal CP/M command editing, including control-U, control-R and control-X.

After Raid signs on, it prompts with the exclamation mark. Immediate error messages indicate why a wrong command was rejected. The first command is usually to load the target program to be debugged, and is followed by a command to load the symbol file of the target program into the symbol table area.

```
!GF:TESTFILE.COM (C/R)
!GF:TESTFILE.SMB (C/R)
```

Raid will load any file type (except .SMB files) into the CP/M TPA at address 100 hex, unless a load offset value is defined. Dot SMB files are always loaded into the symbol table area. With both files loaded you can begin debugging.

Raid provides you with track and sector disk I/O. Simple commands can specify the number of tracks and sectors in the system mass storage, so compatibility need not be a problem. Data port I/O that completes the link to the outside world is also available.

All the standard features are available in Raid. Memory and registers can be filled and examined. Break points can be set and execution initiated in a single-step or run mode. After any break the program can proceed in the run or single-step mode. Since the proceed-single-step command is likely to be the most-used command, Raid assigns *this three-key-stroke* command to the escape key. The value of this function cannot be exaggerated. It typifies how easy to use Raid is; it's like having a five-speed, syncro-mesh transmission. You seldom feel bogged down by a lack of efficient commands or overwhelmed by multiple keystrokes.

Beyond these elementary functions are some of the more sophisticated features that set Raid apart from other debugging tools. Before describing some of the more elaborate features, a word about the stack.

Raid has an internal stack that has 100 bytes for 50 return addresses or pushes. However, you can define your own stack area when you need to maintain the stack within the program boundaries or if the Raid stack is too small. The emulator will still monitor a defined external stack just as it will monitor the Raid internal stack. I've found it convenient to use the internal stack provided by Raid and avoid defining program stack space until after the program is debugged.

Open Mode Commands

Except for the move memory and fill

(continued on p. 156)

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